Progressive Education Society's

Modern College Of Engineering, Pune-05

1186A, Shivaji Nagar, Pune- 411 005.

DEPARTMENT OF INFORMATION TECHNOLOGY

E- Curriculum Booklet

YEAR: 2019-20 **SEMESTER: I**

CLASS: SE **DIV: A & B**

VISION AND MISSION OF THE INSTITUTE

Vision Statement:

To create a collaborative academic environment to foster professional excellence and ethical values

Mission Statement:

1. To develop outstanding professionals with high ethical standards capable of creating and managing global enterprises
2. To foster innovation and research by providing a stimulating learning environment
3. To ensure equitable development of students of all ability levels and backgrounds
4. To be responsive to changes in technology, socio-economic and environmental conditions
5. To foster and maintain mutually beneficial partnerships with alumni and industry

VISION AND MISSION OF THE DEPARTMENT

Vision Statement:

To develop proficient IT engineers for the Industry and Society.

Mission Statement:

1. To achieve academic excellence.
2. To develop students for being competent in dynamic IT environment.
3. To encourage research and innovation.
4. To inculcate moral and professional ethics.

PEO's OF THE DEPARTMENT

1. Demonstrate sustained learning by building the profound foundation of math's, science and engineering principles and make the students erudite self-reliant and adaptable to diverse culture of multidisciplinary environment.
2. Prepare graduate with strong knowledge and skills in the field of Information Technology to develop solutions of complex engineering problems.
3. To bring leadership skill with teamwork in continuous learning environment to bear with professional challenges.
4. To inculcate ethics towards issues of professional and social relevance.

PSO's OF THE DEPARTMENT

1. Graduate exhibits skills to analyze, design and develop software.
2. Graduate demonstrate technical competency and leadership qualities to work in multidisciplinary environment.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

6.The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

LONG TERM GOALS

1. To Improve Industry Collaboration.
2. Promote Faculty for Research.
3. To Introduce Post Graduates Programme and Research Center.
4. To Enhance Infrastructure and lab development.

SHORT TERM GOALS

1. To enhance teaching learning process with effective utilization of e-resources
   - Moodle
   - Kahoot.
   - Activity Based Teaching.
   - Online Courses. (NPTEL/Spoken Tutorials)
2. To organize national level conference / workshop.
3. Focused Interaction with Alumni.
   - Forum for Career Guidance
   - Guidelines for Training and Placements
   - Expert /Webinar/Seminar
   - Suggestions on Programme Improvisation.

INDEX

STUDENT ACADEMIC CALENDAR

Sr. No.	Day & Date	Activity
1.	13/06/2019 Monday	• Time Table Display(SE-BE)
2.	15/06/2019 Saturday	• Term commencement (SE-BE). • Student registration. • HOD's address.
3	15/07/2019 Monday	• Display of Attendance Review I (SE-BE). • Counseling by GFM & HOD.
4.	01/08/2019 Thursday	• Term commencement (FE)*. • Student registration. • HOD's address.
5.	07-12/08/2019 Monday-Saturday	• Mid Term Lab Verification(SE-BE)
6.	15/08/2019 Thursday	• Independence Day Celebration.
7.	16/08/2019 Friday	• Display of Attendance Review II (SE-BE). • Counseling by GFM & HOD.
8.	31/08/2019 Saturday	• Display of Attendance Review I (FE).*
9.	16/09/2019 Monday	• Display of Attendance Review III (SE-BE). • Counseling by GFM & HOD.
10.	23 – 28/09/2019 Monday - Saturday	• Mid Term Lab Verification (FE)
11.	03/10/2019 Thursday	• Display of Attendance Review II (FE).*
12.	04/10/2019 Friday	• Display of submission schedule (SE-BE).
13.	09-12/10/2019 Wednesday -Saturday	• Mock Oral/Practical Exam (SE-BE). • Submission (SE-BE).
14.	14/10/2019 Monday	• Display of final Attendance Review (SE-BE). • Counseling by GFM & HOD.

15.	16/10/2019 Wednesday	• Term End (SE-BE).
16.	18/10/2019 - 05/11/2019 Friday - Tuesday	• University Practical / Oral Exam (SE-BE).
17.	01/11/2017 Friday	• Display of Attendance ReviewIII(FE).*
18.	09/11/2017 Saturday	• Display of submission schedule (FE).*
19.	09/11/2019 Saturday	• Submission (FE)*
20.	14/11/2019 - 07/12/2019 Thursday - Saturday	• University Theory Exam (SE- BE).
21.	23/11/2017 Saturday	• Display of final Attendance Review (FE).*
22.	*28/11/2019 Thursday	• Term End (FE).
23.	*9/12/2019 - 24/12/2019 Monday - Saturday	• University Theory Exam (FE).*
24.	16/12/2019 Monday	• Term –II Commencement (FE-BE)

* These are tentative dates, subject to change.

** Exam form submission, SE Online Examination, TE, BE In-Semester Examination, Theory Examination will be scheduled as per Savitribai Phule Pune University notification.

HOD

Department of Information Technology

STUDENT CO CURRICULER ACTIVITY CALENDAR

Sr No.	Date	Name of activity	Duration	Mapping with PO's	Guest speaker with Organization	Beneficiaries	Faculty Incharge
ITSA							
1.	21/6/19	International Yoga Day	2 Hrs	PO 12	Ms.Rajshree Karande Ms.Janhavi Kulkarni	SE/TE/BE and Staff	Mrs.Swapna Bhavsar
2.	15/09/18	Engineer's Day Celebration	2 Hrs	PO 9	ITSA Committee	SE, TE, BE	Mrs.Y.D.Fatangare
App Club							
3.	2/8/19	Session on PHP Mysql for website development	1 day	3,5,12	Suraj Patil	SE/TE/BE	Mr Deepak Tamhane Mr Rohit Tate
4.	30/8/19	Session on Android app development	1 day	3,5,12	Aniruddha Kudalkar	SE/TE/BE	Mr Deepak Tamhane Mr Rohit Tate
GraphiX Club							
5.	27/7/19	Workshop on "animation tool"	1 day	PO 3, 5,9,12		SE/TE/BE	Mrs.Deepali Naik

6.	24/8/19	Session on "Introduction to GPU programming"	1 day	PO 3,5	Mr.Yadnesh Kulkarni	SE/TE/BE	Mrs.Deepali Naik
PixInsight Club							
7.	24/07/19	Collage Making Competition (Theme: Save Earth, Save life)	1 day	PO 7,9,10		SE / TE /BE	Mrs.S.L Bhat Mrs.Kopal M.
Audit Course							
8.	During Semester	Japanese Language Module I & III	20 Hrs	PO 9,12	Ms.Amita Godse	SE/TE/BE	Mrs. A.A.Bhamre
CSI							
9.	31/8/19	AI is worship or curse?	2 Hrs	PO 6	Ms. Suvarna Kadam DY Patil Akurdi	SE/TE/BE	Ms.Smita Khavate
ED Activities							
10.	16/8/19 & 17/8/19	Udyojak: an ED Program	2 Days	PO 9,10,12	Ms.Umap Mr.Mantha n	SE/TE/BE	Mr.Digvijay Patil
Industry Institute Interaction (III)							
11.	26/9/1	Industrial	1 day	PO 10,11,1	--	SE/TE/BE	Mr.Vishnu

	9	Visit		2			Kamble
FDP							
National Service Scheme(NSS)/ Institute Social Responsibility (ISR)							
12.		Tree Plantation	1 day	PO 7	Mr.Deepak Tamhane PES's MCOE, IT Dept	SE,TE ,BE	Mr.Deepak Tamhane
Alumni Activities							
13.	6/7/19	Importance of Japanese Language and career Opportunities in Jana	1 Hr	PO 9,12	Mr. Aniket Shendge	SE/TE	Mr. Swapna Bhavsar/ Mr. Vishnu Kamble

HOD

Department of Information Technology

TIME TABLE – SE(A)

	9.00 am-10.00 am	10.00 am-11.00 am	11.00am-11.15am	11.15am-12.15 pm	12.15pm-1.15pm	1.15pm-2.00pm	2.00pm-3.00pm	3.00pm-4.00pm
MON	PL 'A' PL1 (SJ) PL 'B' PL2 (SAK) OOPL'C' SL1(RS) DL 'D' HL (SD)			PL 'A' PL1 (SJ) PL 'B' PL2 (SB) DL 'C' HL (SD) OOPL'D' SL1(RS)			COA (DP) 316	FDS (SJ) 316
TUE	CLL'A' SL1(SDD) CLL 'B' HL (SB) PL 'C' PL1 (SJ) PL 'D' PL2 (SAK)		RECESS	PL 'C' PL1 (SJ) PL 'D' PL2 (SB) OOPL 'A' SL1 (RS) DL 'B' HL(SD)		RECESS	DS (SSB) 316	DELD (SD) 316
WED	DL 'A' HL (SD) OOPL'B' NL(RS)			FDS (SJ) 316	PSOOP (RS) 316		DELD (SD) 316	DS (SSB) 316
		Tutorial C & D(316)						
THU	PSOOP (RS)	DELD (SD)		COA (DP)	COA (DP)		FDS (SJ)	PSOOP (RS)
FRI	DELD (SD) 316	DS (SSB) 316		PSOOP (RS) 316	DS (SSB) 316		COA (DP) 316	FDS (SJ) 316
Day /Time	**8.45 am-09.45am**	**9.45am-10.45am**	**10.45 am-**	**11.00am-12.00 pm**	**12.00pm-1.00pm**			
SAT	C&LL 'C' NL(SB) C&LL 'D' OSL(SDD) TUT A& B 316		RECESS	Activity/ Japanese Language(419,316)				

GFM : -Ms.Rajashree Sadphule Co-GFM :-Ms.Suhasini Bhat

Name of the Subject	Teaching Staff & Seating Arrangement	Practical Lab
DELD:Digital Electronics & Logic Design	SD:Mrs.Sonali Deo-412(B)	413(C)- HL: Hardware lab
COA:Computer Organisation & Architecture	DP:Mr.Digvijay Patil-415(B)	414(B)- PL2 :Programming Lab 2
FDS:Fundamentals of Data Structure	SJ:Ms.Supriya Jagtap-416(C) SAK:Mrs.Sampada Kulkarni-413(A)	417(A)- SL1 : Software Lab1
DS: Discrete Structure	SSB:Mrs.Swapna Bhavsar-418(B)	417(B)- SL2 : Software Lab2
PS&OOP:Problem Solving and OOPs	RS - Ms.Rajashri Sadafule-415(A)	417(A)- SL1 : Software Lab1
C&LL : Communication & Language Lab	SB: Ms.Suhasini Bhat-416(A) SDD:Mrs.Sarita Deshpande-412(C)	416(B)- NL: Network lab 416(B)- OSL:Operating

TIME TABLE SE B

SE (Semester I)

Day/ Time	11.15am-12.15am	12.15pm-1.15pm	1.15pm-2.00pm	2.00 pm - 3.00pm	3.00pm - 4.00pm	4.00pm-4.15pm	4.15pm - 5.15pm	5.15pm - 6.15pm
MON	FDS (MJ) 316	DS (SP) 316	RECESS	PL 'A' PL1 (MJ) PL 'B' PL2 (VK) OOPL'D' SL1(AAB) DL 'C' HL (PR)		RECESS	PL 'A' PL1 (MK) PL 'B' PL2 (VK) DL 'D' HL (PR) OOPL'C' SL1(AAB)	
TUE	CO (VK) 316	DELD (PR) 316		C&LL 'A' SL1(SDD) C&LL 'B' SL2(SB) PL 'C' PL1(MJ) PL 'D' PL2(VK)			OOPL'A' SL1(AAB) DL 'B' HL (PR) PL 'C' PL1(MK) PL 'D' PL2(VK)	
WED	CO (VK) 419	FDS (MJ) 419		PSOOP (AAB) 419	DELD (PR) 419		DL 'A' HL (PR) OOPL'B' NL(AAB)	
							Tutorial C & D(316)	RCH(316)
THU	PSOOP (AAB) 419	FDS (MJ) 419		CO (VK) 419	DS (SP) 419		DELD (PR) 316	DELD (PR) 316
FRI	C&LL 'C' NL(SB) C&LL 'D' OSL(SDD)			FDS (MJ) 419	CO (VK) 419		DS (SP) 316	PSOOP (AAB) 316
	RCH(419)	Tutorial A & B (419)						
Day /Time	**11.00 am - 12.00 pm**	**12.00 pm to 1.00 pm**	**1.00 pm - 1.15 pm**	**1.15 pm - 2.15 pm**	**2.15 pm - 3.15 pm**			
SAT	Activity /Japanese Language(419,316)		RECESS	DS (SP) 316	PSOOP (AAB) 316			

GFM : -Ms.Mukta Jamage Co-GFM :-Ms.Poonam Rakibe

Name of the Subject	Teaching Staff & Seating Arrangement	Practical Lab
DELD:Digital Electronics & Logic Design	PR:Ms. Poonam Rakibe-418(B)	413(C)- HL: Hardware lab
COA:Computer Organisation & Architecture	VK: Mr. Vishnu Kamble-418(C)	414(B)- PL2 :Programming Lab 2
FDS:Fundamentals of Data Structure	MK:Ms.Mukta Jamage -416(C) VK:Mr.Vishnu Kamble-418(C)	417(A)- SL1 : Software Lab1
DS:Discrete Structure	SP:Mr.Shantanu Pawar418(C)	417(B)- SL2 : Software Lab2
PS&OOP:Problem Solving and OOPs	AAB:Mrs.Ashwini Bhamre-416(C)	417(A)- SL1 : Software Lab1

C&LL : Communication & Language Lab	SB:Mrs.Suhasini Bhat-416(C) SDD:Mrs.Sarita Deshpande-412(C)	413(C)- HL: Hardware lab

COURSE STRUCTURE

SEMESTER – I

Subject Code	Subject	Teaching Scheme			Examination Scheme					Total Marks	Credits
		Lecture	Tutorial	Practical	Theory Paper	Theory Online	TW	PR	OR		
214441	Discrete Structures	4	--	--	50	50	--	--	--	100	4
214442	Computer Organization & Architecture	4	--	--	50	50				100	4
214443	Digital Electronics and Logic Design	4	--	--	50	50	--	--	--	100	4
214444	Fundamentals of Data Structures	4	--	--	50	50	--	--	--	100	4
214445	Problem Solving and Object Oriented programming	4	--	--	50	50	--	--	--	100	4
214446	Digital Laboratory	--	--	2	--	--	25	50	--	75	1
214447	Programming Laboratory	--	--	4	--	--	25	50	--	75	2
214448	Object Oriented programming Lab.	--	--	2	--	--	25	50		75	1
214449	Communication Skills	--	--	2	--		25	--	--	25	1
	Audit Course	--	--	--	--	--	--	--	--	Grade	
	Total	**20**	**--**	**10**	**250**	**250**	**100**	**150**	**--**	**750**	**25**
	Total of Part-I	**30 Hours**				**750**					

IMPORTANT INSTRUCTIONS

1. It is essential that the student attends all classes in time from the first day to the last day of each term.
2. Minimum of 75% attendance for lectures and practical sessions is mandatory for all students.
3. In case the attendance falls below 75% , term will not be granted and the student will not be allowed to appear for the University examination
4. Student should complete term work such as Journals, Files as per schedule. If the student fails to complete the term work to the entire satisfaction of the Head of the Department his/her term will not be granted and he/she will not be allowed to appear for the University examination.
5. Attendance to all class tests or internals exams is compulsory.
6. Students are always required to carry Identity card (duly signed by Authority) everyday to college and shall show the same on demand by any faculty/official of the Institute in the campus.
7. Students are advised to maintain good rapport with classmates and staff.
8. Institute uniform is compulsory on specified days, during University examinations, for internal tests and special functions decently dressed on the other days of the week.

TERM WORK EVALUATION CRITERIA

Final term work will be given based on throughout performance of the student. 100 marks are distributed in (60 for continuous assessment + 15 for internal test result + 5 for general behavior + 20 for attendance of student)

- 60 marks shall be awarded to the students, based on their journal work, which includes experiment's write up, program print out. Each assignment should be evaluated for 10 marks.
    - Distribution of 10 marks for each assignment is as follows:

Sr. No.	Head	Marks
i.	Coding standards, proper indentation, Comments, Documentation	2 Marks
ii.	Timely submission	3 Marks
iii.	Test cases / originality / Understanding of Assignment	5 Marks

- 15 marks shall be allotted based on the marks of Class test/ Assessment test per unit/ mock exam.
- 5 marks for General Behavior.
- 20 Marks as per the college policy for Term Work, marks are to be awarded for attendance as per the below, based on the percentage of attendance per subject, combining lectures and practical's together, wherever applicable.

Sr .No.	%of attendee=total(Lectures + Practical's attended)	Marks
1	90 to 100	20
2	85to<90	16
3	80to<85	12
4	75 to <80	10

EXAM EVALUATION CRITERIA

University Examination

Phase I Online examination of 25 marks, 30 minutes duration, containing objective- multiple choice questions (MCQ) and fill in blanks; based on unit I and unit II of the subject

Phase II Online examination of 25 marks, 30 minutes duration, containing objective- multiple choice questions (MCQ)) and fill in blanks; based on unit III and unit IV of the subject

University Practical Examination of 50 marks oral/ practical duration 3 hr, contain problem statement based on assignment submitted as term work during lab hours Each chit will have 3 problem statements

- Every student will pick up one chit randomly and will perform one assignment/experiment out of three written on his/her chit.
- Practical examination will be based on the term work.
- Oral examination (if applicable i.e. in case of Oral as a separate passing head) will be based on journal and theory syllabus
- Questions will be asked during the practical examination to judge the understanding of the practical performed in the examination

Note: student will be allowed for university practical examination only when, all types of assignments given by respective staff and Satisfying attendance criteria

Phase III Written examination of 50 marks, 2 hours duration; based on all the six units, shall be conducted at the end of semester, as per the schedule of the university.

Internal Examination

MCQ Test 1

Test of 25 marks, 30 minutes duration, containing objective- multiple choice questions (MCQ) and fill in blanks; based on unit I and unit II of the subject.

MCQ Test 1

Test of 25 marks, 30 minutes duration, containing objective- multiple choice questions (MCQ) and fill in blanks; based on unit I and unit II of the subject

214441

DISCRETE STRUCTURES

SYLLABUS

214441: DISCRETE STRUCTURES

Teaching Scheme	Credit	Examination Scheme
Lectures: 4 Hrs/week 04	In-Semester (Online): 50 Marks	
		End- Semester: 50 Marks

Unit I: Permutations, Combinations and Discrete Probability (6 Hrs)

Permutations and Combinations: rule of sum and product, Permutations, Combinations, Algorithms for generation of Permutations and Combinations. Discrete Probability, Conditional Probability, Bayes' Theorem, Information and Mutual Information

Unit II: Sets and Propositions (6Hrs)

Sets, Combination of sets, Venn Diagrams, Finite and Infinite sets, Un-countably infinite sets, Principle of inclusion and exclusion, multisets. Propositions, Conditional Propositions, Logical Connectivity, Propositional calculus, Universal and Existential Quantifiers, Normal forms, methods of proofs, Mathematical Induction

Unit III: Relations and Functions (6Hrs)

Properties of Binary Relations, Closure of relations, Warshall's algorithm, Equivalence Relations and partitions, Partial ordering relations and lattices, Chains and Anti chains.

Recurrence Relations

Recurrence Relation, Linear Recurrence Relations With constant Coefficients, Homogeneous Solutions, Total solutions, solutions by the method of generating functions

Functions

Functions, Composition of functions, Invertible functions, Pigeonhole Principle, Discrete Numeric functions and Generating functions, Job scheduling Problem.

Unit IV: Graph Theory (8 Hrs)

Basic terminology, representation of graph in computer memory, multi graphs and weighted graphs, Subgraph, Isomorphic graph, Complete ,regular and bipartite graphs, operation on graph, paths and circuits, Hamiltonian and Euler paths and circuits, shortest path in weighted graph(Dijkstra's algorithm), factors of a graph, planer graph and Travelling salesman problem, Graph coloring.

Unit V: Trees (8 Hrs)

Trees, rooted trees, path length in rooted trees, prefix codes and optimal prefix codes,, binary search trees, tree traversals, spanning trees, Fundamental cicuits and and cut set, minimal spanning trees, Kruskal's and Prim's algorithms for minimal spanning tree, The Max flow –Min cut theorem (transport network).

Unit VI: Groups and Rings (8 Hrs)

Algebraic Systems, Semi Groups, Groups, Monoid, Abelian Groups, Subgroups, Permutation Groups, Codes and Group codes, Isomorphism and Automorphisms, Homomorphism and Normal Subgroups, Ring, Integral Domain, Field, Ring Homomorphism, Polynomial Rings and

Course Objectives :

1. Learn the use of set, proof techniques and determine logical possibilities in a given situation.
2. Learn relations, functions among various entities in real world.
3. Learn to apply relations and functions in real life.
4. Learn to formulate problem mathematically using graph theory and trees.

Course Outcomes :

1. Make use of set, relation and function to formulate problem and solve it.
2. To determine different counting techniques and discrete problems.
3. To choose suitable graph and tree structure in real time scenario.
4.To illustrate the concept of groups and rings.

Text Books

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7thedition, McGraw-Hill, ISBN0-07-289905-0
2. C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics", 4th Edition, McGraw-Hill

Reference Books

1. N. Biggs,"Discrete Mathematics", 2nd Edition, Oxford University Press
2. Singh, "Discrete Mathematical Structures", Wiley, ISBN-9788126527908
3. Eric Gossett, "Discrete Mathematics with Proof", Wiley, 2nd Edition, ISBN-9788126527588
4. Edgar G. Goodaire, Michael M. Parmenter, Discrete Mathematics with Graph Theory, Pearson Education, 3rdEdition, ISBN-13: 978-0131679955
5. Richard Johnsonbaugh, "Discrete Mathematics" 7th Edition, Person Education, ISBN : 9332535183

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit	Assessment Technique	Blooms Taxonomy Category
C214441.1	Formulate the problems and solve it by using different counting techniques.	I	MCQ Test	Creating , Applying
C214441.2	Formulate and solve the problems of Set, Relations and Functions.	II & III	MCQ Test	Creating , Applying
C214441.3	Study formal proof techniques with examples.	II	MCQ Test	Remembering
C214441.4	Illustrate the basic terminology and model problems using Graphs and Trees.	IV & V	MCQ Test + Unit Test	Understanding , Applying
C214441.5	Understanding and implementing the concepts of groups and rings.	VI	Unit Test	Understanding, Applying

PREREQUISITES

Sr. No.	Unit Number	Prerequisite subject name
1.	I	Basic Mathematics
2.	II	Basic Mathematics
3.	III	Basic Mathematics
4.	IV	Basic Mathematics
5.	V	Basic Mathematics
6.	VI	Basic Mathematics

TEACHING PLAN

Teaching Plan Short

Academic Year:-2019-20 Semester :-I w. e. f. :-15/06/2019

Class : - SE Division: A &B

Subject :- Discrete Structure Subject Code :- 214441

Faculty In charge :-Mrs.S. S.Bhavsar& Mr. S. S.Pawar No. of Lectures/ weeks: 4

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start week	End week
1.	I	**Permutations, Combinations and Discrete Probability**	2nd Week June	4th Week June
2.	II	**Sets and Propositions**	4th Week June	2nd week July
3.	III	**Relations and Functions**	2nd week July	1st Week August
4.	IV	**Graph Theory**	1st Week August	4th week August
5.	V	**Trees**	4th week August	2nd week September
6.	VI	**Groups and Rings**	2nd week September	4th week September

Detail Teaching Plan

Lect No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO to Attain	Measurable to attain CO	Mode of Delivery
1	**I**	PERMUTATION COMBINATION AND DISCRETE PROBABILITY	rule of sum and product , Permutations	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"	C214441.1	Mock MCQ Test	Chalk and Talk
2			Permutations	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"			Chalk and Talk
3			Combinations	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"			Chalk and Talk
4			Combinations	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"			Chalk and Talk
5			Algorithms for generation of Permutations and Combinations	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"			Chalk and Talk
6			Discrete Probability	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"			Chalk and Talk
7			Conditional Probability	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"			Chalk and Talk

8			Bayes' Theorem	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"			Chalk and Talk
9			Information and Mutual Information	C. L. Liu and D. P. Mohapatra, "Elements of Discrete Mathematics"			Chalk and Talk
10	II	**Sets and Propositions**	Sets, Combination of sets,	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education	C214441.2 and C214441.3	Mock MCQ Test and Class Test	Chalk and Talk
11			Venn Diagrams	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
12			Finite and Infinite sets, Un-countably infinite sets	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
13			Principle of inclusion and exclusion, multisets. Propositions, Conditional Propositions	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
14			Logical Connectivity, Propositional calculus	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk

15			Universal and Existential Quantifiers, Normal forms,	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
16			methods of proofs	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
17			Mathematical Induction	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
18	III	Relation and Functions	Properties of Binary Relations, Equivalence Relations, Closure of relations	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education	C214441.2	Mock MCQ Test	Chalk and Talk
19			Warshall's algorithm,	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
20			Equivalence partitions, Partial ordering relations and lattices	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk

21			Chains and Anti chains.	R. Johnsonbaugh, “Discrete Mathematics”, 5th Edition, Pearson Education			Chalk and Talk
22			Functions, Recurrence Relation	R. Johnsonbaugh, “Discrete Mathematics”, 5th Edition, Pearson Education			Chalk and Talk
23			Linear Recurrence Relations With constant Coefficients, Homogeneous Solutions	R. Johnsonbaugh, “Discrete Mathematics”, 5th Edition, Pearson Education			Chalk and Talk
24			Total solutions, solutions by the method of generating functions	R. Johnsonbaugh, “Discrete Mathematics”, 5th Edition, Pearson Education			Chalk and Talk
25			Composition of functions, Invertible functions	R. Johnsonbaugh, “Discrete Mathematics”, 5th Edition, Pearson Education			Chalk and Talk
26			Pigeonhole Principle, Discrete Numeric functions	R. Johnsonbaugh, “Discrete Mathematics”, 5th Edition, Pearson Education			Chalk and Talk

27			Job scheduling Problem	R. Johnsonbaugh, “Discrete Mathematics”, 5th Edition, Pearson Education			Chalk and Talk
28	IV	GRAPH THEORY	Basic terminology, representation of graph in computer memory , multi graphs and	C. L. Liu and D. P. Mohapatra,“Elements of Discrete Mathematics”	C214441.4	Mock MCQ Test	Chalk and Talk
29			weighted graphs, ,Subgraph	C. L. Liu and D. P. Mohapatra,“Elements of Discrete Mathematics”			Chalk and Talk
30			Isomorphic graph, Complete regular and bipartite graphs, operation on graph,	C. L. Liu and D. P. Mohapatra,"Elements of Discrete Mathematics”,			Chalk and Talk
31			paths and circuits	C. L. Liu and D. P. Mohapatra,“Elements of Discrete Mathematics”,			Chalk and Talk
32			Hamiltonian and Euler paths and circuits	C. L. Liu and D. P. Mohapatra,“Elements of Discrete Mathematics”,			Chalk and Talk
33			shortest path in weighted	C. L. Liu and D. P. Mohapatra,“Elements of			Chalk and Talk

			graph(Dijkstra's algorithm),	Discrete Mathematics",			
34			factors of a graph, planer graph	C. L. Liu and D. P. Mohapatra,"Elements of Discrete Mathematics"			Chalk and Talk
35			Travelling salesman problem, Graph coloring	C. L. Liu and D. P. Mohapatra,"Elements of Discrete Mathematics",			Chalk and Talk
			Assessment of Unit I,II,III,IV		University MCQ Test		
36	V	TREES GROUPS AND RINGS	Trees, rooted trees, path length in rooted trees	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
37			prefix codes and optimal prefix codes, binary search trees	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education	C214441.4	Mock UnitTest	Chalk and Talk
38			tree traversals, spanning trees,	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
39			Fundamental circuits and cut set	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition,			Chalk and Talk

				Pearson Education			
40			minimal spanning trees	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
41			Kruskal's and Prim's algorithms for minimal spanning tree	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
42			The Max flow –Min cut theorem (transport network)	R. Johnsonbaugh, "Discrete Mathematics", 5th Edition, Pearson Education			Chalk and Talk
43	VI		Algebraic Systems, Semi Groups.	B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures", 4th Edition,Pearson Education	C214441.5	Mock Unit Test	Chalk and Talk
44			Groups, Monoid, Abelian Groups	B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures			Chalk and Talk
45			Subgroups, Permutation	B. Kolman, R. Busby and S. Ross, "Discrete Mathematical			Chalk and Talk

			Groups	Structures",			
46			Codes and Group codes	B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures",			Chalk and Talk
47			Isomorphism and Automorphisms, Homomorphism and Normal Subgroups	B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures"			Chalk and Talk
48			Ring, Integral Domain, Field	B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures"			Chalk and Talk
49			Ring Homomorphism, Polynomial Rings	B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures"			Chalk and Talk
50			Cyclic Codes Assignment 3	B. Kolman, R. Busby and S. Ross, "Discrete Mathematical Structures"			Chalk and Talk
			Assessment of Unit I,II,III,IV, V , VI			University Theory Exam	

UNIT WISE QUESTION BANK

Unit 1

Q.No	Question	CO	Marks	University Year
1	A single card is drawn from an ordinary deck S of 52 cards. Find the probability p that : (i) The card is a king. (ii) The card is a face card (jack, queen or king). (iii) The card is a heart. (iv) The card is a face.	1	6	2014
2	Find number of arrangement that can be made out of letters : (i) ASSASSINATION (ii) GANESHPURI.	1	7	2014
3	In a certain college town, 25% of the students failed in mathematics,15% failed in chemistry, and 10% failed both in mathematics and chemistry. A student is selected at random : (i) If he failed in chemistry, what is the probability that he failed in mathematics ? (ii) If he failed in mathematics, what is the probability that he failed in chemistry ? (iii) What is the probability that he failed in mathematics or chemistry ? (iv) What is the probability that he failed neither in mathematics nor in chemistry ?	1	7	2014
4	12 persons are made sit around a table. Find the number of ways they can sit such that 2 specific persons are not together.	1	6	2014
5	Find the smallest number of people you need to choose at random so that the probability that at least two of them were both born on April 1 exceeds ½. Assume number of days in year as 366 days.	1	6	2018
6	A club has 25 members : (i) How many ways are there to choose four members of the club o serve on an executive committee ? (ii) How many ways are there to choose a president, vice president, secretary, and treasurer of the club, where no person can hold more than one office ?	1	6	2018
7	Out of a total 130 students,60 are wearing hats,51 are wearing scarves,and 30 are wearing both hats and scarves.Out of 54 students who are wearing sweaters , 26 are wearing hats, 21 are wearing scarves,and 12 are wearing both hats and scarves.Everyone wearing neither a hat nor a	1	6	2017

	scarf is wearing gloves: (a) How many students are wearing gloves? (b) How many students not wearing a sweater are wearing hats but not scarves? (c) How many students not wearing a sweater are wearing neither hat nor scarf?			
8	Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?	1	3	2017
9	In a box, there are 8 red, 7 blue, 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?	1	3	2017
10	Prove by induction that the sum of cubes of three consecutive integers are divisible by 9.	1	6	2017
11	Two cards are drawn together from a pack of 52 cards. Determine the probability that one is spade and one is a heart.	1	4	2017
12	Three unbiased coins are tossed.What is the probability of getting at most two heads?	1	2	2017
13	A survey of 70 high school students revealed that 35 like folk music, 15 like classical music , and 5 like both. How many of the students surveyed do not like either folk or classical music?	1	6	2015

Unit 2

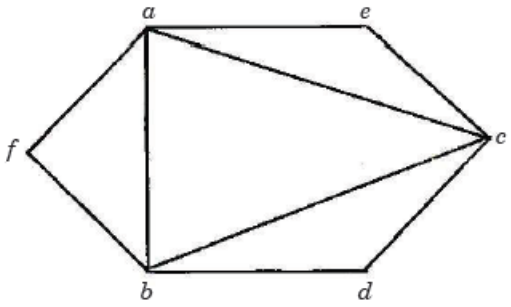
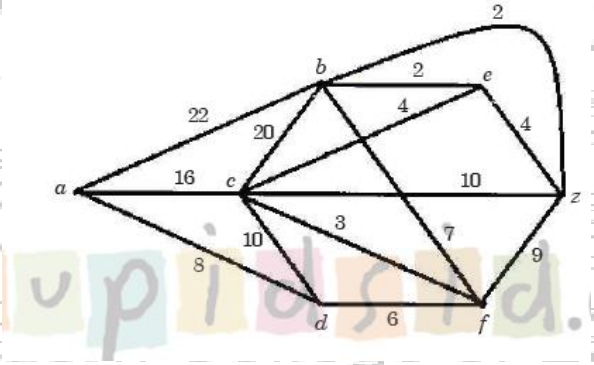
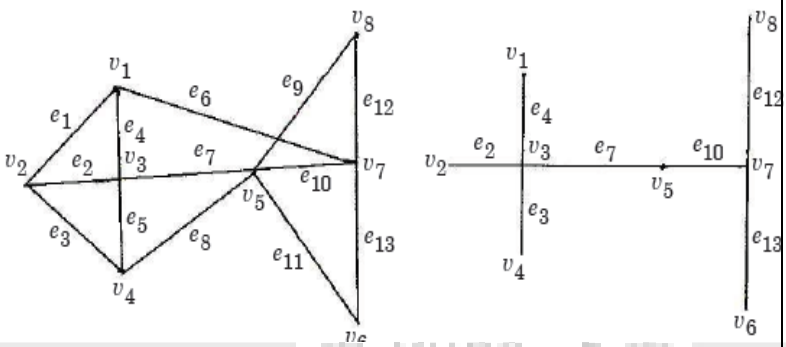
Q.No	Question	CO	Marks	University Year
1	Show that (A-B)-C= A – (BUC) Using Venn diagram	2	3	2015
2	Obtain CNF for following $\sim(p \vee q) \leftrightarrow (p \wedge q)$	2	3	2015
3	During a survey of the ice cream preferences of students, it was found that 22 like mango, 25 like custard apple, 39 like grape, 9 like custard apple and mango, 17 like mango and grape, 20 like custard apple and grape, 6 like all flavors and 4 like none. Then how many students were surveyed ? How many students like exactly one flavor, how many students like exactly two flavors?	2	6	2014
4	State the principle of Mathematical Induction, using mathematical induction prove the following proposition $P(n)= 1 + 4 + 7 + \text{----}+(3n - 2)= \frac{n(3n - 1)}{2}$	2	6	2014
5	Show that each of these conditional statements is a tautology by using truth tables : (i) $(p \wedge q) \rightarrow p$	2	6	2018

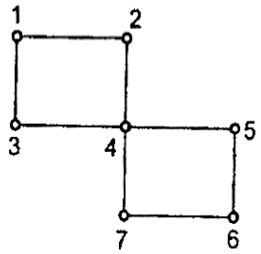
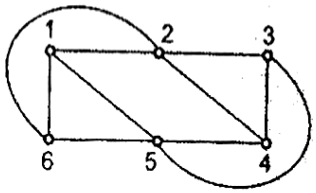
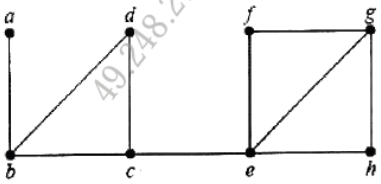
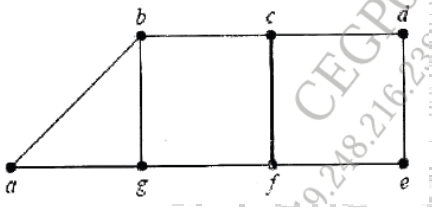
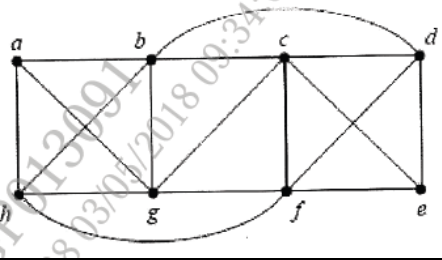
	(ii) $p \rightarrow (p \vee q)$.			
6	There are 2504 computer science students at a school. Of these, 1876 have taken a course in Java, 999 have taken a course in Linux, and 345 have taken a course in C. Further, 876 have taken courses in both Java and Linux, 231 have taken courses in both Linux and C, and 290 have taken courses in both Java and C. If 189 of these students have taken courses in Linux, Java, and C, how many of these 2504 students have not taken a course in any of these three programming languages ?	2	6	2018
7	Prove the statement is true using mathematical induction $n^3 + 2n$ is divisible by 3 for all $n >= 1$	2	6	2015
8	Find the transaction closure by using Warshall's algorithm for the given relation as R = {(1, 1), (1, 4), (2, 1), (2, 2), (3, 3), (4, 4).	2	6	2015

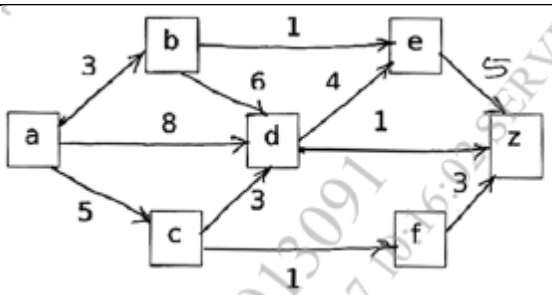
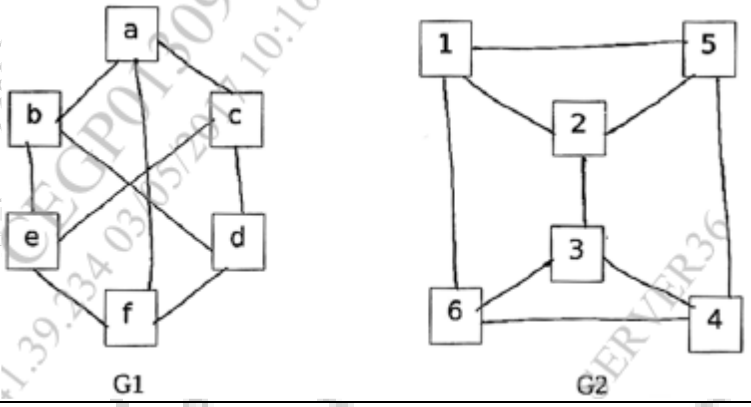
Unit 3

Q.No	Question	CO	Marks	University Year
1	Draw Hasse Diagram on relation R on A. Let A = {1,2,3,4,5} and R={(1,1), (2,1)	2		
2	What is recurrence relation ? Solve the following recurrence relation : ar – 7ar – 1 + 10ar – 2 = 0 given that a0 = 0 and a1 = 3.	2	6	2014
3	Let A = {1, 2, 3, 4} and let R = {(1, 1), (1, 2), (1, 4), (2, 4), (3, 1), (3, 2), (4, 2), (4, 3), (4, 4)}. Find Transitive closure of R using Warshall's Algorithm.	2	6	2014
4	Draw the graph and its equivalent Hasse diagram for divisibility on the set : {1, 2, 3, 6, 12, 24, 36, 48}.	2	6	2018
5	Use Warshall's algorithm to find transitive closure of the following relation on the set {1, 2, 3, 4}, R = {(1, 2), (1, 3), (1, 4,), (2, 3), (2, 4), (3, 4)}	2	6	2018
6	define optimal tree for following set of weights,construct optimal binary prefix code. For each weight in the set give corresponding prefix code: 1,4,8,9,15,25,31,37	2	6	2017
7	Solve the following recurrence relation : $a_n - 7a_{n-1} + 10a_{n-2} = 0,\ a_0 = 0,\ a_1 = 3$	2	6	2017

Unit 4

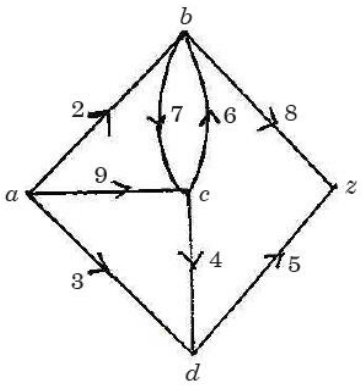
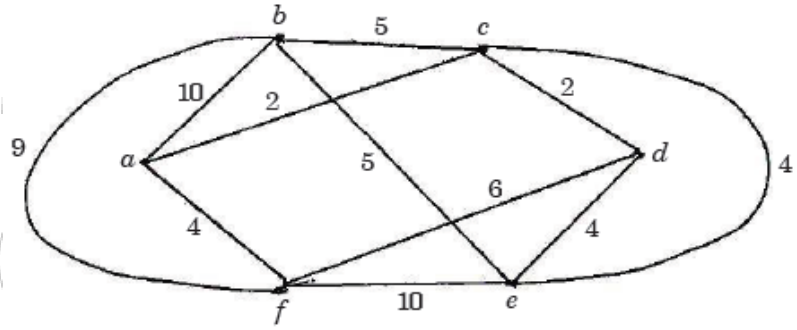
Q.No	Question	CO	Marks	University Year
1	What do you understand by factors of a graph ? Find all possible k-Factors of the following graph : 	4	6	2014
2	Find the shortest path from a to z, using Dijkstra's Algorithm. 	4	6	2014
3	Find fundamental system of cut set for the graph G shown below with respect to the spanning tree T. 	4	6	2014
4	State the theorems for presence of Euler path and circuit in a graph. Justify whether the graphs contain the following properties. If yes, write the path and circuit : (i) Euler path (ii) Euler circuit	4	6	2018

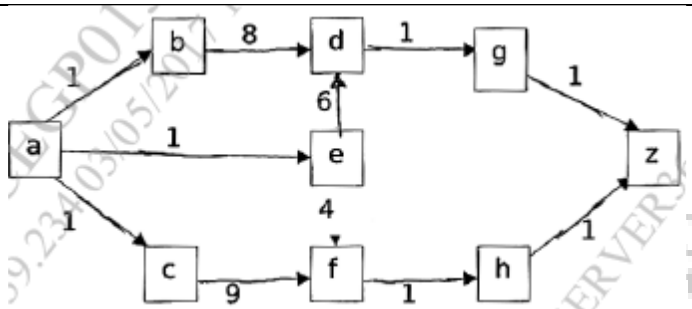
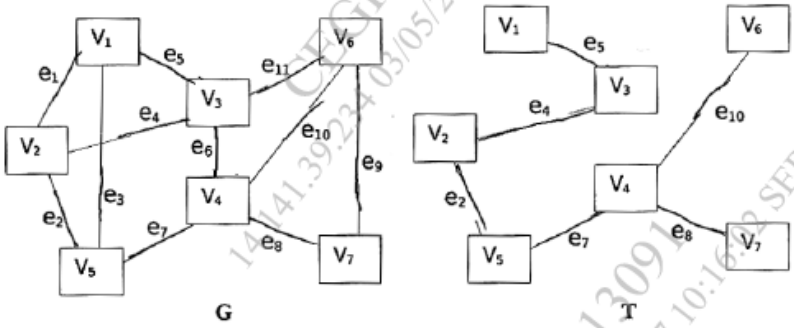
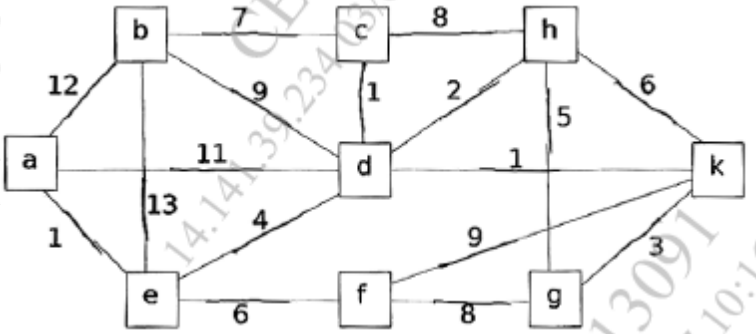
	(iii) Hamiltonian path (iv) Hamiltonian Circuit  G_1  G_2			
5	Find minimum cut set and value of vertex connectivity of the following graphs (i)  (ii)  (iii)  	4	6	2018
6	Solve the following recurrence relations. $a_r - 7a_{r-1} + 10a_{r-2} = 2^r$ $a_1 = 3,\ a_2 = 21.$	4	6	2017
7	Find the shortest path between vertex a to z	4	6	2017

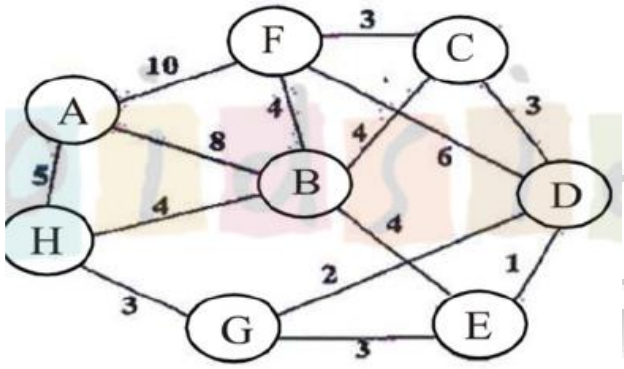
				
8	Functions f,,g and h are defined on sets x={1,2,3} as $f = \{(1, 3), (2, 1), (3, 2)\};$ $g = \{(1, 2), (2, 3), (3, 1)\};$ $h = \{(1, 2), (2, 1), (3, 3)\}$ (1)Find fog and gof. are they equal (2)find fogoh and fohog	4	6	2017
9	Define Isomorphic graph.Show following graphs ar Isomorphic. 	4	6	2017

Unit 5

Q.No	Question	CO	Marks	University Year
1	Determine the maximum flow in the following transport Network.	4	7	2014

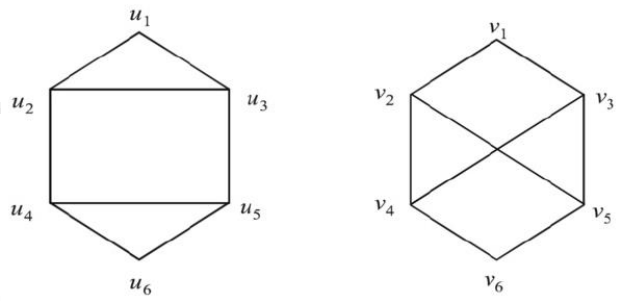
				
2	Define optimal tree. For the following set of weights, construct optimal binary prefix code. For each weight in the set, give corresponding code words — 8, 9, 12, 14, 16, 19.	4	7	2014
3	Use the Kruskal's algorithm to find the minimum spanning tree for the graph shown in the figure. 	4	6	2014
4	How many edges does a full binary tree with 1000 internal vertices have ?	4	6	2018
5	Represent the expression (x + xy) + (x/y) and x + ((xy + x)/y) using binary trees. Write these expressions in : (i) prefix notation (ii) postfix notation (iii) infix notation.	4	7	2018
6	Use Huffman coding to encode these symbols with given frequencies a : 0.20, b : 0.10, c : 0.15, d : 0.25, e : 0.30. What is the average number of bits required to encode a character ?	4	6	2018
7	Find the maximum flow for following transport network.	4	6	2017

				
8	Find the fundamental of cut set for the graph G shown below with respect to the spanning tree T. 	4	6	2017
9	Find the minimum Spanning tree and weight of it for given graph using kruskals algorithms. 	4	7	2017
10	Find minimum spanning tree and its minimum weight Prim's algorithm.	4	6	2015

Unit 6

Q.No	Question	CO	Marks	University Year
1	Consider an algebraic system (G, *), where G is the set of all non-zero real number and * is a binary operation defined by a * b = ab/4. Show that (G, *) is an abelian group.	5	6	2014
2	What is abelian group ? Show that (Z6, +) is an Abelian Group ?	5	7	2018
3	Find the hamming distance between code words of : C = {(0000), (0101), (1011), (0111)} Rewrite the message by adding even parity check bit and odd parity check bit.	5	6	2018
4	Let R = {0º, 60º, 120º, 180º, 240º, 300º} and * = binary operation, so that for a and b in R, a * b is overall angular rotation corresponding to successive rotations by a and then by b. Show that (R, *) is a Group.	5	7	2018
5	Let G = {even, odd} and binary operation _ be defined as : ⊕ | even | odd even | even | odd odd | odd | even Show that (G, _) is a group	5	6	2018
6	Let Q1 be the set of all rational numbers other than 1.Show that with operation * defined on the set Q1 by (a*b=a+b-ab) is an Abelian group.	5	7	2017
7	Let I be the set of all integers. For each of the following determine wheather * is an associative operation or not	5	6	2017

	(1) a * b = max(a, b) (2) a * b = min(x + 2, b) (3) a * b = a − 2b (4) a * b = max(2a − b, 2b − a).			
8	Let Z_n be the set of integers {0, 1, 2, ..., n − 1} ⊕ be a binary operation on Z_n such that : $a \oplus b = \begin{cases} a + b if a + b < n \\ a + b - n if a + b \geq n \end{cases}$ Let ⊙ be a binary operation on Z_n such that : $a \odot b$ = the remainder of ab divided by n.	5	7	2017
9	Consider the (2, 7) encoding function e. $e(00)$ = 0000000 $e(01)$ = 1010101 $e(10)$ = 0111110 $e(11)$ = 0110110 (a) Find the minimum distance of e. (b) How many errors will e detect ?	5	6	2017
10	Determine the following sets together with binary operation represent a group. If so, determine if it is abelian or not ,specify the identity & inverse.(1) set of odd integers, binary operation: multiplication (2) set of all rational numbers binary operation:addition	5	6	2015
11	Determine graph G and H shown in figure are isomorphic or not? 	5	6	2015

Home Assignment

UNIT NO. 1

Q. No.	Question	CO	Marks
1	A box contains 2 white, 3 black and 5 red balls. In how many ways can three balls be drawn from the box if at least one black ball is to be included in the draw?	CO1	6
2	In how many ways can the letters of the word ENCYCLOPAEDIA be arranged such that vowels only occupy the even positions?	CO1	6

UNIT NO. 2

Q. No.	Question	CO	Marks
1	It was found that inn first year of computer science of 80 students, 50 know COBOL, 55 know C language and 46 know Pascal. It was also known that 37 know C and COBOL, 28 know C and Pascal, and 25 know Pascal and COBOL. 7 students however know none of the language. Find: (i) How many know all the three languages? (ii) How many know exactly two languages? (iii) How many know exactly one language?	CO2	6
2	In a class of 55 students, the number of students studying different subjects are as follows: Maths – 23, Physics – 24, Chemistry – 19, Maths + Physics – 12, Maths + Chemistry – 9, Physics + Chemistry – 9, Physics + Chemistry – 7, all three subjects – 4. Find the numbers of students who have taken: (i) At least one subject, (ii) Exactly one subject ,	CO2	6

UNIT NO. 3

Q. No.	Question	CO	Marks
1	Let A be the product set {1, 2, 3} X {a, b}. How many relations are there on A?	CO2	6
2	Let A be a set of lines in a plane. Define the following relation on A: I_1 A I_2iff I_1 is perpendicular	CO2	6

	to I_2.determine whether the properties of a relation are satisfied by R.diagram.		

UNIT NO. 4

Q. No.	Question	CO	Marks
1	Determine the number of edges in a graph with 6 nodes,2 of degree 4 and 4 of degree 2. Draw two such graphs	CO4	6
2	How many nodes are necessary to construct a graph with exactly 6 edges in which edge node is of degree 2	CO4	6

UNIT NO. 5

Q. No.	Question	CO	Marks
1	Determine the number of edges in a graph with 6 nodes,2 of degree 4 and 4 of degree 2. Draw two such graphs	CO4	6
2	What is the union of (i) two null graphs N3 and N4 (ii) two complete graph K2 and K3	CO4	7

UNIT NO. 6

Q. No.	Question	CO	Marks
1	Consider the binary operation table defined on the set A = {a, b, c, d} Then a * (b * c) =	CO5	6
2	Let(A,*)be an algrbric system where * is a binary operation such that for any a,b, belongs to A a*b=a i)show that * is an associative operation and can *ever be a commutative operation	CO5	6

*	a	b	c	d
a	b	c	a	d
b	c	b	a	d
c	a	b	c	d
d	d	a	b	C

QUESTION BANK (MCQ)

Unit 1

Q.No	Question	CO	Marks
1	From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done? A.564 B)645 C)735 D)756 E)None of these	CO1	1
2	In how many different ways can the letters of the word 'LEADING' be arranged in such a way that the vowels always come together? A)360 B)480 C)720 D)5040 E)None of these. Answer: C	CO1	1
3	In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together? A)810 B)1440 C)2880 D)50400 E)5760 Answer: D	CO1	1
4	In how many ways can the letters of the word 'LEADER' be arranged? A)72 B)144 C)360 D)720 E)None of these Answer:C	CO1	2
5	In a group of 6 boys and 4 girls, four children are to be selected) In how many different ways can they be selected such that at least one boy should be there? A)159 B)194 C)205 D)209 E)None of these Answer:D	CO1	2

6	How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated? A)5 B)10 C)15 D)20 Answer:D	CO1	1
7	In how many ways a committee, consisting of 5 men and 6 women can be formed from 8 men and 10 women? A)266 B)5040 C)11760 D)86400 E)None of these Answer:C	CO1	1
8	A box contains 2 white balls, 3 black balls and 4 red balls) In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw? A)32 B)48 C)64 D)96 E)None of these. Answer:C	CO1	1
9	In how many different ways can the letters of the word 'DETAIL' be arranged in such a way that the vowels occupy only the odd positions? A)32 B)48 C)36 D)60 E)120 Answer:C	CO1	1
10	In how many ways can a group of 5 men and 2 women be made out of a total of 7 men and 3 women? A)63 B)90 C)126 D)45 E)135 Answer:A	CO1	2
11	How many 4-letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed? A)40 B)400 C)5040 D)2520	CO1	2

	Answer:C		
12	In how many different ways can the letters of the word 'MATHEMATICS' be arranged so that the vowels always come together? A)10080 B)4989600 C)120960 D)None of these Answer:C	CO1	1
13	In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together? A)120 B)720 C)4320 D)2160 E)None of these Answer:B	CO1	1
14	There are 30 people in a party If everyone is to shake hands with one another, how many hand shakes are possible? A)180 B)256 C)386 D)435 Answer:D	CO1	1
15	A box contains 4 black, 3 red and 6 green marbles. 2 marbles are drawn from the box at random. What is the probability that both the marbles are of the same color? A)12/74 B)24/78 C)13/78 D)None of these. Answer:B	CO1	1
16	A box contains 2 white, 3 black and 5 red balls. In how many ways can three balls be drawn from the box if at least one black ball is to be included in the draw? A)29 B)36 C)48 D)85 E)None of these. Answer:D	CO1	2
17	On a shelf, 2 books of Geology, 2 books of Sociology and 5 of Economics are to be arranged in such a way that the books of any subject are to be together. Find in how many ways can this be done? A)3846 B)2880 C)900	CO1	2

	D)90 E)None of these. Answer:B		
18	A briefcase has a number-lock system containing a combination of 3 digits (Each digit can be of numbers 0 to 8). If the correct combination is unknown, how much maximum time would be required to open the bag if each "trial" of combination takes 3 seconds? A) 45.23 minutes B) 36.45 minutes C) 60.34 minutes D) 90.15 minutes E) 50.9 minutes Answer:B	CO1	1
19	A person can go from place "P" to "Q" by 7 different modes of transport, but is allowed to return back to "P" by any mode other than the one used earlier. In how many different ways can he complete the entire journey? A) 42 B) 30 C) 11 D) 5^6 E) 6^5 Answer:A	CO1	1
20	In how many ways can the letters of the word ENCYCLOPAEDIA be arranged such that vowels only occupy the even positions? A) 453600 B) 128000 C) 478200 D) 635630 nswer:A	CO1	1
21	How many 3-letter words can be formed out of the letters of the word 'CORPORATION', if repetition of letters is not allowed? A) 990 B) 336 C) 720 D) 504 Answer:B	CO1	1
22	In how many different ways can the letters of the word 'GEOMETRY' be arranged so that the vowels always come together? A) 720 B) 4320 C) 2160 D) 40320 Answer:B	CO1	2
23	In a group containing 6 cows and 4 buffalos, 4 livestock are to be selected in such a way that at least 1 cow should always be present. How many way of doing that are possible?	CO1	2

	A) 209 B) 205 C) 194 D) 163		
24	In how many ways can the letters of the word ENCYCLOPAEDIA be arranged such that vowels only occupy the even positions? A) 453600 B) 128000 C) 478200 D) 635630 Answer:A	CO1	1
25	In how many ways can the letters of the word INDIA be arranged, such that all vowels are never together? A) 48 B) 42 C) 28 D) 36 Answer:B	CO1	1
26	How many Permutations of the letters of the word APPLE are there? A) 600 B) 120 C) 240 D) 60 ANSWER:D	CO1	1
27	From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done? A) 564 B) 645 C) 735 D) 756 ANSWER:D	CO1	1
28	How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated? A) 5 B) 10 C) 15 D) 20 ANSWER:D	CO1	2
29	In how many ways a committee, consisting of 5 men and 6 women can be formed from 8 men and 10 women? A) 266 B) 5040 C) 11760 D) 86400 ANSWER:C	CO1	2

30	How many 4-letter words with or without meaning, can be formed out of the letters of the word, 'LOGARITHMS', if repetition of letters is not allowed? A) 40 B) 400 C) 5040 D) 2520 ANSWER:C	CO1	1

Unit 2

1	Two unbiased coins are tossed. What is probability of getting at most one tail ? A) 1/2 B) 1/3 C) 3/2 D)3/4 ANSWER:D	CO2	1
2	In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither blue nor green? A) 2/3 B) 8/21 C) 3/7 D) 9/22 ANSWER:B	CO2	1
3	From a pack of 52 cards, two cards are drawn together, what is the probability that both the cards are kings A) 2/121 B) 2/221 C) 1/221 D) 1/13 ANSWER:C	CO2	1
4	If S(x)=x is a teacher, W(x)=x is intelligent, then symbolic representation of the statement "Every teacher is not intelligent" is A) ∀x{S(x)} B) ∃x{S(x)∧~W(x)} C) ∃x{~S(x)∧~W(x)} D) ∃x{W(x)∧S(x)} ANSWER:B	CO2	2
5	Which of the following is a tautology? A) ~{p∧(~p)} B) p∧p C) ~p∧~p D) p∨p ANSWER:A	CO2	2
6	p -> q is false when A) p is true, q is false	CO2	1

	B) p is false, q is true C) p is true, q is true D) p is false, q is false ANSWER:A		
7	Negation of the statement "He is neither intelligent nor a player" is A) He is intelligent or a player B) He is intelligent and a player C) He is intelligent but not a player D) He is not intelligent but a player. ANSWER:A	CO2	1
8	If q -> ~p is F, then A) p is T, q is T B) p is T, q is F C) p is F, q is T D) p is F, q is F ANSWER:A	CO2	1
9	The contrapositive of p -> q is A) ~q ⇒ ~p B) ~p ⇒ ~q C) ~p ⇒ q D) q ⇒ p ANSWER:A	CO2	1
10	If p ^ (p -> q) is T, then A) p is T, q is F B) p is F, q is T C) p is T, q is T D) p is F, q is F ANSWER:C	CO2	2
11	(p ^ (p -> q))->q is logically equivalent to A) p ∨ q B) (p ^ q) ∨ (¬p ^ ¬q) C) 0,0,0,0 D) (¬p ∨ q) ^ (p ∨ q) ANSWER:C	CO2	2
12	Out of 100 students, 10 students study Hindi, English and Mathematics, 20 study Hindi and English, 30 study English and Mathematics, 25 study Hindi and Mathematics, 12 study Hindi only, 5 study English only and 8 study Mathematics only. Then the number of students who study neither of these three subject is A) 7 B) 8 C) 0 D) 1 ANSWER:A	CO2	1
13	A-B is equal to A) A ∩ B B) A ∪ B	CO2	1

	C) A ∩ B' D) none of these ANSWER:C		
14	$(\mathbf{P} \cap \mathbf{Q} \cap \mathbf{R}) \cup (\mathbf{P}^c \cap \mathbf{Q} \cap \mathbf{R}) \cup \mathbf{Q}^c \cup \mathbf{R}^c$ is If P, Q, R are subsets of the universal set U, then A) Qc ∪ RC B) P ∪ Qc ∪ RC C) Pc ∪ Qc ∪ RC D) U ANSWER:D	CO2	1
15	A _____ is an ordered collection of objects. A) Relation B) Function C) Set D) Proposition ANSWER:C	CO2	1
16	The set O of odd positive integers less than 10 can be expressed by _____ A) {1, 2, 3} B) {1, 3, 5, 7, 9} C) {1, 2, 5, 9} D) {1, 5, 7, 9, 11} ANSWER:B	CO2	2
17	Power set of empty set has exactly _____ subset. A) One B) Two C) Zero D) Three ANSWER:A	CO2	2
18	Which of the following two sets are equal? A) A = {1, 2} and B = {1} B) A = {1, 2} and B = {1, 2, 3} C) A = {1, 2, 3} and B = {2, 1, 3} D) A = {1, 2, 4} and B = {1, 2, 3} ANSWER:C	CO2	1
19	The set of positive integers is _____ A) Infinite B) Finite C) Subset D) Empty ANSWER:A	CO2	1
20	The members of the set S = {x | x is the square of an integer and x < 100} is _____ A) {0, 2, 4, 5, 9, 58, 49, 56, 99, 12} B) {0, 1, 4, 9, 16, 25, 36, 49, 64, 81} C) {1, 4, 9, 16, 25, 36, 64, 81, 85, 99}	CO2	1

	D) {0, 1, 4, 9, 16, 25, 36, 49, 64, 121} ANSWER:B		
21	Two sets are called disjoint if there _____ is the empty set. A) Union B) Difference C) Intersection D) Complement ANSWER:C	CO2	1
22	The complement of the set A is _____ A) A – B B) U – A C) A – U D) B – A ANSWER:B	CO2	2
23	The set difference of the set A with null set is _____ A) A B) null C) U D) B ANSWER:A	CO2	2
24	What are the chances that no two boys are sitting together for a photograph if there are 5 girls and 2 boys? A) 1/21 B). 4/7 C). 2/7 D) 5/7 ANSWER:D	CO2	1
25	What is probability of drawing two clubs from a well shuffled pack of 52 cards? A) 13/51 B) 1/17 C) 1/26 D) 13/17 ANSWER:B	CO2	1
26	When two coins are tossed simultaneously, what are the chances of getting at least one tail? A) 3/4 B). 1/5 C) 4/5 D) 1/4 ANSWER:A	CO2	1
27	In a drawer there are 4 white socks, 3 blue socks and 5 grey socks. Two socks are picked randomly. What is the possibility that both the socks are of same color? A) 4/11 B) 1 C) 2/33 D) 19/66	CO2	2

	ANSWER:D		
28	In a set of 30 game cards, 17 are white and rest are green. 4 white and 5 green are marked IMPORTANT. If a card is chosen randomly from this set, what is the possibility of choosing a green card or an 'IMPORTANT' card? A) 13/30 B) 22/30 C) 17/30 D) 9/13 ANSWER:C	CO2	2
29	There are 2 pots. One pot has 5 red and 3 green marbles. Other has 4 red and 2 green marbles. What is the probability of drawing a red marble? A) 9/14 B) 31/48 C) 1 D) 1/2 ANSWER:B	CO2	1
30	A pot has 2 white, 6 black, 4 grey and 8 green balls. If one ball is picked randomly from the pot, what is the probability of it being black or green? A) 3/4 B) 7/10 C) 4/3 D) 1/10 ANSWER:B	CO2	1

Unit 3

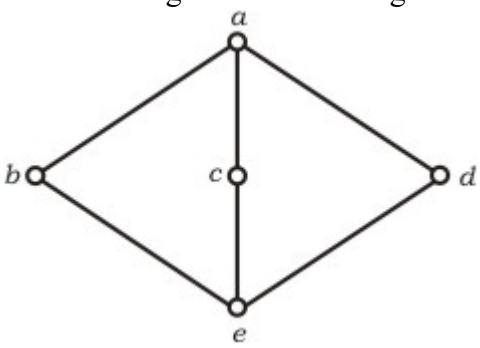
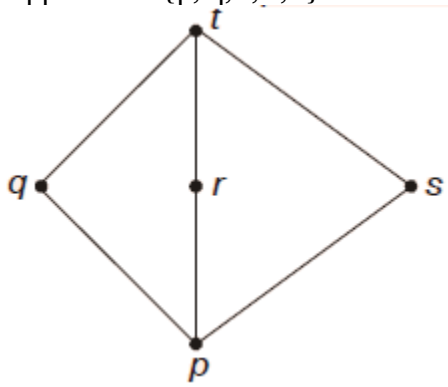
1	Let Z denote the set of all integers. Define f : Z —> Z by f(x) = {x / 2 (x is even) 0 (x is odd) then f is A) one-one and onto B) one-one but not onto C) onto but not one-one D) neither one-one nor-onto Answer C	CO2	1
2	Let R be a relation "(x -y) is divisible by m", where x, y, m are integers and m > 1, then R is A) partial order B) equivalence relation C) symmetric but not transitive D) anti symmetric and not transitive Answer B	CO2	1

3	If A = {1, 2, 3} then relation S = {(1, 1), (2, 2)} is A) symmetric only B) anti-symmetric only C) an equivalence relation D) both symmetric and anti-symmetric Answer D	CO2	1
4	Which of the following statements is true? A) Empty relation φ is reflexive B) Every equivalence relation is a partial-ordering relation. C) Number of relations form A = {x, y, z} to B= {1, 2} is 64. D) Properties of a relation being symmetric and being ant-symmetric are negative of each other. Answer C	CO2	2
5	Let A = {1, 2, ...3 } Define ~ by x ~ y ⇔ x divides y. Then ~ is A) Symmetric B) an equivalence relation C) a partial-ordering relation D) relexive, but not a partial-ordering Answer C	CO2	2
6	If X and Y be the sets. Then the set (X - Y) union (Y- X) union (X intersection Y) is equal to? A)X union Y B)Xc union Yc C)X intersection Y D)Xc intersection Yc Answer A	CO2	1
7	If f(x) = 2x then range of the function is : A) (-∞, ∞) B) (-∞, ∞) – {0} C) (0, ∞) D) None of the mentioned Answer C	CO2	1
8	What is domain of function f(x) = x-1 for it to be defined everywhere on domain? A) (2, ∞) B) (-∞, ∞) – {0}	CO2	1

	C) [0, ∞) D) None of the mentioned Answer B		
9	Let R be a non-empty relation on a collection of sets defined by ARB if and only if A ∩ B = Ø Then (pick the TRUE statement) A) R is relexive and transitive B) R is an equivalence relation C) R is symmetric and not transitive D) R is not relexive and not symmetric Answer C	CO2	1
10	The binary relation S = Φ (empty set) on set A = {1, 2,3} is A) transitive and reflexive B) symmetric and reflexive C) transitive and symmetric D) neither reflexive nor symmetric Answer C	CO2	2
11	"n/m" means that n is a factor of m, then the relation T is A) relexive, transitive and not symmetric B) relexive, transitive and symmetric C) transitive and symmetric D) relexive and symmetric Answer A	CO2	2
12	If R be a symmetric and transitvie relation on a set A, then A) R is not reflexive and hence not an equivalence relation B) R is reflexive and hence an equivalence relation C) R is reflexive and hence a partial order D) None of these	CO2	1

	) Answer D		
13	Let P(S) denote the power set of set S. Which of the following is always TRUE ? A) $S \notin P(S)$ B) $P(P(S)) = P(S)$ C) $P(S) \cap S = P(S)$ D) $P(S) \cap P(P(S)) = [\varphi]$ Answer D	CO2	1
14	Let S be an infinite set and S1, S2, S3, ..., Sn be sets such that S1 ∪S2 ∪S3∪ .....Sn = S then A) atleast one of the sets Si is a finite set B) atleast one of the sets Si is an ininite set C) not more than one of the set Si can be inite D) none of these Answer B	CO2	1
15	Sort the following functions in the decreasing order of their asymptotic (big-O) complexity: f1(n) = n^√n , f2(n) = 2^n, f3(n) = (1.000001)^n , f4(n) = n^(10)*2^(n/2) A) f2> f4> f1> f3 B) f2> f4> f3> f1 C) f1> f2> f3> f4 D) f2> f1> f4> f3 Answer B	CO2	1
16	f(n) = 2^(2n) Which of the following correctly represents the above function? A) O(2^n) B) Ω(2^n) C) Θ(2^n) D) None of these Answer B	CO2	2
17	Master's theorem can be applied on which of the following recurrence relation? A) T (n) = 2T (n/2) + 2^n B) T (n) = 2T (n/3) + sin(n) C) T (n) = T (n-2) + 2n^2 + 1 D) None of these Answer D	CO2	2
18	T(n) = 3T(n/2+ 47) + 2n^2 + 10*n – 1/2. T(n) will be	CO2	1

	A) O(n^2) B) O(n^(3/2)) C) O(n log n) D) None of these Answer A		
19	Some group (G, 0) is known to be abelian. Then which one of the following is TRUE for G ? A) $g = g^{-1}$ for every $g \in G$ B) $g = g^2$ for every $g \in G$ C) $(g \circ h)^2 = g^2 \circ h^2$ for every $g,h \in G$ D) G is of finite order Answer C	CO2	1
20	If the binary operation * is deined on a set of ordered pairs of real numbers as (a, b) * (c, d) = (ad + bc, bd) and is associative, then (1, 2) * (3, 5) * (3, 4) equals A) (7,11) B) (23,11) C) (32,40) D) (74,40) Answer D	CO2	1
21	If A = (1, 2, 3, 4). Let ~ = ((1, 2), (1, 3), (4, 2). Then ~ is A) reflexive B) Transitive C) symmetric D) not anti-symmetric Answer B	CO2	1
22	If R = {(1, 2),(2, 3),(3, 3)} be a relation defined on A= {1, 2, 3} then R . R(= R2) is A) R itself B) {(1, 2),(1, 3),(3, 3)} C) {(1, 3),(2, 3),(3, 3)} D) {(2, 1),(1, 3),(2, 3)} Answer C	CO2	2
23	A relation R is defined on ordered pairs of integers as follows: (x,y) R(u,v) if x < u and y > v. Then R is: Then R is: A) Neither a Partial Order nor an Equivalence Relation B) A Partial Order but not a Total Order C) A Total Order	CO2	2

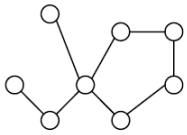
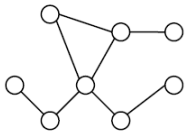
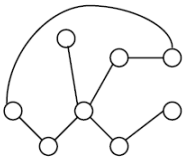
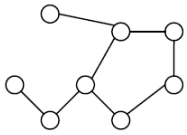
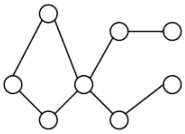
	D) An Equivalence Relation Answer A		
24	The following is the Hasse diagram of the poset [{a, b, c, d, e}, ≤]  The poset is A) not a lattice B) a lattice but not a distributive lattice C) a distributive lattice but not a Boolean algebra D) a Boolean algebra Answer B	CO2	1
25	The inclusion of which of the following sets into S = {{1, 2}, {1, 2, 3}, {1, 3, 5}, (1, 2, 4), (1, 2, 3, 4, 5}} is necessary and sufficient to make S a complete lattice under the partial order defined by set containment ? A) {1} B) {1}, {2, 3} C) {1}, {1, 3} D) {1}, {1, 3}, (1, 2, 3, 4}, {1, 2, 3, 5) Answer A	CO2	1
26	Suppose L = {p, q, r, s, t} is a lattice represented by the following Hasse diagram:  For any x, y ∈ L, not necessarily distinct, x ∨ y and x ∧ y are join and meet of x, y respectively. Let L3 = {(x,y,z): x, y, z ∈ L} be the set of all ordered triplets of the elements of L. Let pr be the probability that an element (x,y,z) ∈ L3 chosen equiprobably satisfies x ∨ (y ∧ z) = (x ∨ y) ∧ (x ∨ z). Then A) Pr = 0 B) Pr = 1 C) 0 <Pr ≤ 1/5	CO2	1

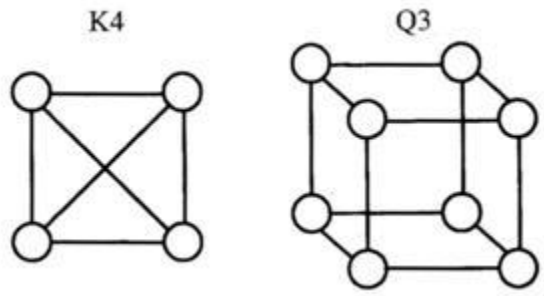
	D) 1/5 <Pr< 1 Answer D		
27	The g -1({0}) for the function g(x)= ⌊x⌋ is _____ A) {x | 0 ≤ x < 1} B) {x | 0 < x ≤ 1} C) {x | 0 < x < 1} D) {x | 0 ≤ x ≤ 1} Answer D	CO2	1
28	Range of a function is : A) the maximal set of numbers for which a function is defined B) the maximal set of numbers which a function can take values C) it is set of natural numbers for which a function is defined D) none of the mentioned Answer B	CO2	2
29	If f(x) = x2 + 4 then range of f(x) is given by A) [4, ∞) B) (-∞, ∞) – {0} C) (0, ∞) D) None of the mentioned Answer A	CO2	2
30	Domain of a function is : A) the maximal set of numbers for which a function is defined B) the maximal set of numbers which a function can take values C) it is set of natural numbers for which a function is defined D) none of the mentioned Answer A	CO2	1

Unit 4

1	Consider an undirected random graph of eight vertices. The probability that there is an edge between a pair of vertices is 1/2. What is the expected number of unordered cycles of length three? A) 1/8 B) 1 C) 7 D) 8 Answer C	CO4	1

2	Which of the following statements is/are TRUE for undirected graphs? P: Number of odd degree vertices is even. Q: Sum of degrees of all vertices is even. A) P only B) Q only C) Both P and Q D) Neither P nor Q Answer C	CO4	1
3	The line graph L(G) of a simple graph G is defined as follows: · There is exactly one vertex v(e) in L(G) for each edge e in G. · For any two edges e and e' in G, L(G) has an edge between v(e) and v(e'), if and only if e and e'are incident with the same vertex in G. Which of the following statements is/are TRUE? (P) The line graph of a cycle is a cycle. (Q) The line graph of a clique is a clique. (R) The line graph of a planar graph is planar. (S) The line graph of a tree is a tree. A) P only B) P and R only C) R only D) P, Q and S only Answer A	CO4	1
4	Let G be a simple undirected planar graph on 10 vertices with 15 edges. If G is a connected graph, then the number of bounded faces in any embedding of G on the plane is equal to A) 3 B) 4 C) 5 D) 6	CO4	2

	Answer D		
5	Which of the following graphs is isomorphic to  (A)  (B)  (C)  (D)  A) A B) B C) C D) D Answer B	CO4	2
6	Let G be a complete undirected graph on 6 vertices. If vertices of G are labeled, then the number of distinct cycles of length 4 in G is equal to A) 15 B) 30 C) 45 D) 360 Answer C	CO4	1

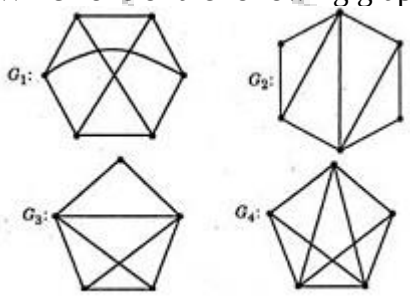
7	 A) K4 is planar while Q3 is not B) Both K4 and Q3 are planar C) Q3 is planar while K4 is not D) Neither K4 nor Q3 are planar Answer B	CO4	1
8	Let G = (V,E) be a graph. Define $\xi(G) = \Sigma d\ id\ x\ d$, where id is the number of vertices of degree d in G. If S and T are two different trees with $\xi(S) = \xi(T)$,then A) $\|S\| = 2\|T\|$ B) $\|S\| = \|T\|-1$ C) $\|S\| = \|T\|$ D) $\|S\| = \|T\|+1$ Answer C	CO4	1
9	The degree sequence of a simple graph is the sequence of the degrees of the nodes in the graph in decreasing order. Which of the following sequences can not be the degree sequence of any graph? I. 7, 6, 5, 4, 4, 3, 2, 1 II. 6, 6, 6, 6, 3, 3, 2, 2 III. 7, 6, 6, 4, 4, 3, 2, 2 IV. 8, 7, 7, 6, 4, 2, 1, 1 A) I and II B) III and IV C) IV only D) II and IV	CO4	1

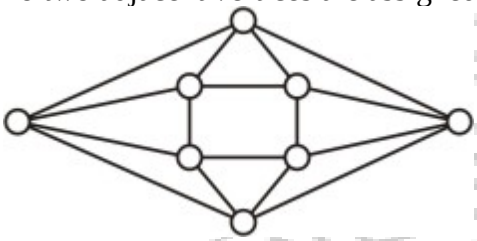
	) Answer D		
10	What is the chromatic number of an n-vertex simple connected graph which does not contain any odd length cycle? Assume n >= 2. A) 2 B) 3 C) n-1 D) n Answer A	CO4	2
11	Which one of the following is TRUE for any simple connected undirected graph with more than 2 vertices? A) No two vertices have the same degree. B) At least two vertices have the same degree. C) At least three vertices have the same degree. D) All vertices have the same degree. **Answer B**	CO4	2
12	Which of the following statements is true for every planar graph on n vertices? A) The graph is connected B) The graph is Eulerian C) The graph has a vertex-cover of size at most 3n/4 D) The graph has an independent set of size at least n/3 **Answer C**	CO4	1
13	G is a graph on n vertices and 2n - 2 edges. The edges of G can be partitioned into two edge-disjoint spanning trees. Which of the following is NOT true for G? A For every subset of k vertices, the induced subgraph has at most 2k-2	CO4	1

	) edges B) The minimum cut in G has at least two edges C) There are two edge-disjoint paths between every pair to vertices D) There are two vertex-disjoint paths between every pair of vertices **Answer D**		
14	Let G be the non-planar graph with the minimum possible number of edges. Then G has A) 9 edges and 5 vertices B) 9 edges and 6 vertices C) 10 edges and 5 vertices D) 10 edges and 6 vertices **Answer C**	CO4	1
15	Which of the following graphs has an Eulerian circuit? A) Any k-regular graph where kis an even number. B) A complete graph on 90 vertices C) The complement of a cycle on 25 vertices D) None of the above **Answer C**	CO4	1
16	Let G=(V,E) be a directed graph where V is the set of vertices and E the set of edges. Then which one of the following graphs has the same strongly connected components as G ? (A) $G_1 = (V, E_1)$ where $E_1 = \{(u,v) \mid (u,v) \notin E\}$ (B) $G_2 = (V, E_2)$ where $E_2 = \{(u,v) \mid (v,u) \in E\}$ (C) $G_3 = (V, E_3)$ where $E_3 = \{(u,v) \mid there\ is\ a\ path\ of\ length \leq 2\ from\ u\ to\ v\ in\ E\}$ (D) $G_4 = (V_4, E)$ where V_4 is the set of vertices in G which are not isolated	CO4	2

	A) A B) B C) C D) D **Answer B**		
17	Consider an undirected graph G where self-loops are not alloweD) The vertex set of G is {(i, j): 1 <= i<= 12, 1 <= j <= 12}. There is an edge between (a, b) and (c, d) if |a − c| <= 1 and |b − d| <= 1. The number of edges in this graph is _____. A) 500 B) 502 C) 506 D) 510 **Answer C**	CO4	2
18	An ordered n-tuple (d1, d2, … ,dn) with d1 >= d2 >= ···>= dn is called graphic if there exists a simple undirected graph with n vertices having degrees d1, d2, … , dn respectively. Which of the following 6-tuples is NOT graphic? A) (1, 1, 1, 1, 1, 1) B) (2, 2, 2, 2, 2, 2) C) (3, 3, 3, 1, 0, 0) D) (3, 2, 1, 1, 1, 0) **Answer C**	CO4	1
19	A cycle on n vertices is isomorphic to its complement. The value of n is _____. A) 2 B) 4 C) 6 D) 5	CO4	1

	) **Answer D**		
20	If G is a forest with n vertices and k connected components, how many edges does G have? A) floor(n/k) B) ceil(n/k) C) n-k D) n-k+1 **Answer C**	CO4	1
21	Let d denote the minimum degree of a vertex in a graph. For all planar graphs on n vertices with d ≥ 3, which one of the following is TRUE? A) In any planar embedding, the number of faces is at least n/2 + 2 B) In any planar embedding, the number of faces is less than n/2 + 2 C) There is a planar embedding in which the number of faces is less than n/2 + 2 D) There is a planar embedding in which the number of faces is at most n/(d+1) **Answer A**	CO4	1
22	The 2^n vertices of a graph G corresponds to all subsets of a set of size n, for n >= 6 . Two vertices of G are adjacent if and only if the corresponding sets intersect in exactly two elements. The number of vertices of degree zero in G is: A) 1 B) n C) n+1 D) 2^n **Answer C**	CO4	2
23	The 2^n vertices of a graph G corresponds to all subsets of a set of size n, for n >= 6. Two vertices of G are adjacent if and only if the corresponding sets intersect in exactly two elements. The number of connected components in G is: A) n B) n+2	CO4	2

	C) $2^{n/2}$ D) 2^n / n **Answer B**		
24	Let G be a simple connected planar graph with 13 vertices and 19 edges. Then, the number of faces in the planar embedding of the graph is A) 6 B) 8 C) 9 D) 13 **Answer B**	CO4	1
25	Let G be a simple graph with 20 vertices and 100 edges. The size of the minimum vertex cover of G is 8. Then, the size of the maximum independent set of G is A) 12 B) 8 C) Less than 8 D) More than 12 **Answer A**	CO4	1
26	Which one of the following graphs is NOT planar?  A) G 1 B) G 2 C) G 3	CO4	1

	D) G 4 **Answer A**		
27	The minimum number of colours required to colour the following graph, such that no two adjacent vertices are assigned the same colour, is  A) 2 B) 3 C) 4 D) 5 **Answer C**	CO4	1
28	Let G be an arbitrary graph with n nodes and k components. If a vertex is removed from G, the number of components in the resultant graph must necessarily lie between A) k and n B) k - 1 and k + 1 C) k - 1 and n - 1 D) k + 1 and n - k **Answer C**	CO4	2
29	How many perfect matchings are there in a complete graph of 6 vertices ? A) 15 B) 24 C) 30 D) 60 **Answer A**	CO4	2
30	A graph G = (V, E) satisfies $\|E\| \leq 3\|V\| - 6$. The min-degree of G is defined as	CO4	1

	$\min_{v \in V} \{\text{degree}(v)\}$. Therefore, min-degree of G cannot be A) 3 B) 4 C) 5 D) 6 **Answer D**		

Additional Resources:-

NIL

214442 Computer Organization & Architecture

SYLLABUS

214442: COMPUTER ORGANIZATION &ARCHITECTURE

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 4 Hours/Week	04	In-Semester(Online): 50 Marks
		End-Semester: 50 Marks

UNIT – I COMPUTER EVOLUTION, PERFORMANCE MEASUREMENT & ARITHMETIC (8 Hours)

A Brief History of Computers, Von Neumann Architecture, Harvard Architecture.

Computer Performance Measurement – Benchmarks (SPEC) for Evaluation, Metrics such as CPU Time, Throughput, etc., Aspects & Factors affecting Computer Performance, Comparing Computer Performances, Marketing Metrics – MIPS & MFLOPS, Speedup & Amdahl's Law Booths Algorithm For Signed Multiplication & it's Hardware Implementation, Restoring And Non Restoring Division Algorithms & it's Hardware Implementation

UNIT – II THE CENTRAL PROCESSING UNIT (8 Hours)

Arithmetic & Logic Unit.

Instruction Sets: - Machine Instruction Characteristics, Types of Operands and Types of Operations , Addressing Modes, Instruction Formats, Instruction Types Processor Structure and Function - Processor Organization, Register Organization, The Instruction Cycle and Instruction Pipelining.

RISC: Instruction Execution Characteristics, RISC Vs CISC, RISC Architecture - MIPS.

UNIT – III THE CONTROL UNIT(8 Hours)

Instruction Cycle & Micro Operations, Functional Requirements & Operations of the Control Unit, Block Schematic & Control Signals, Single Bus Processor Organization, Control Signal example with Micro Operations and Register Transfer.

Control Unit Design Methods - Hardwired Control – State Table Method, Design example – Multiplier CU.

Micro-Programmed Control - Basic Concepts, Microinstructions & Formats, Control Memory, Micro Programmed Control Unit Schematic, Microinstruction Sequencing - Design Considerations, Sequencing Techniques, Address Generation, Microinstruction Execution - A Taxonomy of Microinstructions, Microinstruction Encoding.

UNIT – IV Memory & I/O Organization (8 Hours)

Characteristics of Memory Systems, Internal and External Memory Types.

Memory Hierarchy, Principle Of Locality, Cache Memory – Basics, Performance Metrics & Improvements, Organization and Mapping Techniques, Handling Cache Misses & Writes, Replacement Algorithms, Multilevel Caches, Cache Coherence, Snooping & MESI Protocols, Memory Segmentation & Interleaved Memory System.

Virtual Memory: Main Memory Allocation, Virtual to Physical Address Translation, Paging, Page Placement & Location, Page Faults, TLB in Address Translation, Handling TLB Misses & Page Faults.Input / Output Systems, Programmed I/O, Interrupt Driven I/O, Direct Memory Access (DMA).

UNIT – V Instruction level Parallelism (8 Hours)

MIPS Implementation Overview, Digital Logic for MIPS Implementation, Single Data path for MIPS Architecture, Simple MIPS Implementation with Control Signals.

Overview of Instruction Pipelining, Performance Improvement, MIPS Instruction Set for Pipelining, Pipeline Hazards: Structural, Data – Forwarding & Code Reordering, Control – Branch Prediction,
5 Stage Pipeline with Data path & Control for MIPS Architecture, Graphical Representation of Pipelines, Data Hazards – Forwarding & Stalling for MIPS Pipeline, Control Hazards – Dynamic Branch Prediction & Delayed Branch for MIPS Pipeline. Superscalar Processors.

UNIT - VI Parallel Organization (8 Hours)

Parallel Organization – Multiprocessors, Multicores & Clusters. Flynn's Taxonomy for Multiple Processor Organizations, Closely and Loosely Coupled Multiprocessors Systems, Symmetric Multiprocessor (SMP) Organization, Multithreading – Fine Grained, Coarse Grained & Simultaneous (SMT) Threading, Chip Multiprocessing, Cluster Configuration, UMA, NUMA & CC-NUMA. Multicore Architectures – Hardware & Software Issues in Multicore Organization, Multicore Organizations, and Intel X86 Multicore Organizations – Core Duo & Core i7.

Course Objectives :

1. To understand the structure, function & characteristics of computer systems.
2. To understand the design of the various functional units of digital computers.
3. To understand instruction level parallelism & parallel organization of multi-processor & multi core systems

Course Outcomes :

On completion of the course, learner will be able to–

1. Solve problems based on computer arithmetic.
2. Explain processor structure & its functions.
3. Obtain knowledge about micro-programming of a processor.
4. Understand concepts related to memory & IO organization.
5. Acquire knowledge about instruction level parallelism & parallel organization of multi-processors & multi core systems.

Text Books

1. W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition, Prentice Hall of India, 2010, ISBN 13: 978-0-13-607373-4
2. D. Patterson, J. Hennessy, "Computer Organization and Design: The Hardware Software Interface", 4th Edition, Morgan Kaufmann, Oct 2013, ISBN 978-0-12-374750-1

Reference Books

1. C. Hamacher, V. Zvonko, S. Zaky, "Computer Organization", 5th edition, McGraw Hill, 2002, ISBN: 007-120411-3
2. M. Usha, T. S. Srikanth, Computer System Architecture and Organization", Wiley, 2014, ISBN: 978-81-265-2284-2
3. A. S. Tanenbaum "Structured Computer Organization", 4th Edition, Prentice Hall of India, 1991 ISBN: 81–203–1553–7.
4. G. George, "Computer Organization: Hardware and Software", 2nd Edition, Prentice Hall of India, 1986.
5. J. Hays, "Computer Architecture and Organization", 2nd Edition, McGraw-Hill, 1988 ISBN 0–07–100479–3

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit	Assessment Technique	Blooms Taxonomy Category
C21442.1	Solve problems based on computer arithmetic	I	MCQ Test	Applying
C21442.2	Explain processor structure and its functions	II	MCQ Test	Understanding
C21442.3	Obtain knowledge about microprogramming of a Processor	III	MCQ Test	Understanding
21442.4	Understand concepts related to memory & IO organization.	IV	MCQ Test	Understanding
C21442.5	Acquire knowledge about instruction level parallelism and parallel organization and multi core system	V, VI	End Sem (Theory Test)	Analyzing

PREREQUISITES

Sr. No.	Unit Number	Prerequisite subject name
1.	I	1. Fundamental of Programming Languages. 2. Computer basic knowledge.
2.	II	1. Fundamental of Programming Languages. 2. Computer basic knowledge.
3.	III	1. Fundamental of Programming Languages. 2. Computer basic knowledge.
4.	IV	1. Fundamental of Programming Languages. 2. Computer basic knowledge.
5.	V	1. Fundamental of Programming Languages.
6.	VI	1. Fundamental of Programming Languages.

TEACHING PLAN

TEACHING PLAN

Academic Year: - 2019 -20 Semester:-I w. e.f.: -17/06/2019

Class: SE-IT Division: A/B

Subject: - Computer OrganizationandArchitecure Subject Code: - 214442

Faculty In charge: - Mr.Vishnukamble & Mr. Digvijaypatil No. of Lectures/ weeks: -4

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start Date	End Date
1.	I	Computer Evolution, Performance Measurement & Arithmetic	June 3rdWeek	June 4thWeek
2.	II	The Central Processing Unit	July 1stWeek	July 2ndWeek
3.	III	The Control Unit	July 3rdWeek	July 4thWeek
4.	IV	Memory & I/O Organization	August 1stWeek	August 2nd Week
5.	V	Instruction Level Parallelism	August 3rdWeek	August 4th Week
6.	VI	Parallel Organization	September 1stWeek	September 2ndWeek

Detail Teaching Plan

Lect. No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO to Attain	Measurable to attain CO	Mode of Delivery
1	I	COMPUTER EVOLUTION, PERFORMANCE MEASUREMENT & ARITHMETIC	Introduction to Subject	Ch. 2, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition,	C214442.1	MCQ	Discussion
2			A Brief History of Computers, Von Neumann Architecture, Harvard Architecture				Videos , Chalk & talk
3			Computer Performance Measurement – Benchmarks (SPEC) for Evaluation, Metrics such as CPU Time, Throughput, etc., Aspects & Factors affecting Computer Performance				Discussion
4			Comparing Computer Performances, Marketing Metrics – MIPS & MFLOPS, Speedup & Amdahl's Law				Discussion, Chalk & talk
5			Booths Algorithm For Signed Multiplication & it's Hardware Implementation	Ch. 9, W. Stallings, "Computer Organization and Architecture: Designing for Performance",			Chalk & talk
6			Restoring Division Algorithms & it's Hardware Implementation				Chalk & talk
7			Non - Restoring Division Algorithms & it's Hardware Implementation				Chalk & talk

8			Revision of problems	8th Edition,			Chalk & talk
9	**II**	**THE CENTRAL PROCESSING UNIT**	Arithmetic & Logic Unit. Instruction Sets: - Machine Instruction Characteristics	Ch. 9 & 10, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition,	C214442.2	MCQ Test	PPT, Chalk & Talk
10			Types of Operands and Types of Operations	Ch. 10, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition,			PPT
11			Addressing Modes	Ch. 11, W. Stallings, "Computer Organization and Architecture: Designingfor Performance",			Chalk & talk
12			Instruction Formats, Instruction Types				Chalk & talk

				8th Edition,			
13			Processor Structure and Function - Processor Organization, Register Organization	Ch. 12, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8thEdition,			Chalk & talk
15			The Instruction Cycle				Chalk & talk
16			Instruction Pipelining.				Chalk & talk
17			RISC: Instruction Execution Characteristics, RISC Vs CISC,RISC Architecture - MIPS	Ch. 13, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition,			Chalk & talk
18	**III**	**THE CONTROL UNIT**	Instruction Cycle & Micro Operations	Ch. 15, W. Stallings, "Computer Organization and Architecture :	C214442.3	MCQ Test	Videos
19			Functional Requirements & Operations of the Control Unit				PPT
20			Block Schematic & Control Signals				PPT
21			Single Bus Processor Organization, Control				PPT

			Signal example with Micro Operations and Register Transfer	Designing for Performance" , 8th Edition,			
22			Control Unit Design Methods - Hardwired Control				PPT
23			State Table Method, Design example - Multiplier CU				PPT
24			Micro-Programmed Control - Basic Concepts, Microinstructions & Formats, Control Memory, Micro-Programmed Control Unit Schematic	Ch. 16, W. Stallings, "Computer Organization and Architecture: Designing for Performance" , 8thEdition,			PPT
25			Microinstruction Sequencing - Design Considerations, Sequencing Techniques, Address Generation, Microinstruction Execution - A Taxonomy of Microinstructions, Microinstruction Encoding.				PPT
26	**IV**	**Memory & I/O Organization**	Characteristics of Memory Systems, Internal and External Memory Types.			MCQ Test	Chalk & Talk
27			Memory Hierarchy, Principle Of Locality, Cache Memory – Basics, Performance Metrics &				Chalk & Talk
28			Improvements, Organization and Mapping Techniques				Chalk & Talk
29			Handling Cache Misses & Writes, Replacement Algorithms, Multilevel Caches				Chalk & Talk

30			Cache Coherence, Snooping & MESI Protocols, Memory Segmentation & Interleaved Memory System	Ch. 17, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8thEdition,			Chalk & Talk
31			Virtual Memory: Main Memory Allocation, Virtual to Physical Address Translation	Ch. 8, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition,			Chalk & Talk
32			Paging, PagePlacement& Location, Page Faults, TLB in Address Translation, Handling TLB Misses & Page Faults				Chalk & Talk
33			Input / Output Systems, Programmed I/O, Interrupt Driven I/O, Direct Memory Access (DMA).	Ch. 7, W. Stallings, "Computer Organization and Architecture: Designingfor Performance",			Chalk & Talk

				8th Edition,			
35	**V**	**Instruction level Parallelism**	MIPS Implementation Overview, Digital Logic for MIPS Implementation	Ch. 13, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8thEdition,	C214442.5	Theory Exam	Chalk & Talk
36			Single Data path for MIPS Architecture				Chalk & Talk
37			Simple MIPS Implementation with Control Signals				Chalk & Talk
38			Overview of Instruction Pipelining, Performance Improvement, MIPS Instruction Set for Pipelining				Chalk & Talk
39			Pipeline Hazards: Structural, Data – Forwarding & Code Reordering, Control – Branch Prediction	Ch. 12, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8thEdition,			Chalk & Talk
40			5 Stage Pipeline with Data path & Control for MIPS Architecture				Chalk & Talk
41			Graphical Representation of Pipelines, Data Hazards – Forwarding & Stalling for MIPSPipeline				Chalk & Talk
42			Control Hazards – Dynamic Branch Prediction & Delayed Branch for MIPS Pipeline. SuperscalarProcessors				Chalk & Talk

43	**VI**	**Parallel Organization**	Parallel Organization – Multiprocessors, Multicores & Clusters. Flynn's Taxonomy for MultipleProcessor Organizations	Ch. 17 &18, W. Stallings, "Computer Organization and Architecture: Designing for Performance", 8th Edition,			PPT
44			Closely and Loosely Coupled Multiprocessors Systems				PPT
45			Symmetric Multiprocessor (SMP) Organization				PPT
46			Multithreading – Fine Grained, Coarse Grained & Simultaneous (SMT) Threading				PPT
47			Chip Multiprocessing, Cluster Configuration, UMA, NUMA & CC-NUMA				PPT
48			Multicore Architectures – Hardware &Software Issues in MulticoreOrganization				PPT
49			Multicore Organizations, Intel X86 Multicore Organizations – Core Duo & Core i7				PPT

SubjectTeacher

Mr.VishnukambleDigvijayPatil

SE (Semester I)

UNIT WISE QUESTION BANK

Unit1

Q. No	Question	CO	Marks	University Year
1	Multiply 101011 by 110011 using Booth's algorithm	1	6	May-June 2017 /Nov-Dec2017
2	Perform division using non-restoring method 22/3	1	6	May-June 2017/ Nov-Dec 2017
3	State and explain marketing metrics–MIPS, MFLOPS and Amdahl's law.	1	6	May-June 2018
4	Find CPU time, for program having 10 × 106 instructions which is executed on processor having CPI 1.0, clock rate of 4GHz	1	6	May-June 2018
5	Describe computer performance parameter such asCPU time, CPI, MIPS, MFLOPS, Benchmark, Amdahl'sLaw	1	6	Nov-Dec 2016
6	Multiply 0111 by 0011 using Booth's algorithm	1	6	Nov-Dec 2016
7	Perform division using non-restoring method 15/2	1	6	Nov-Dec 2016
8	Multiply -7 and 3 using Booths Algorithm.	CO1	6	May-June 2019
9	Describe the computer performance parameters such as CPU time , CPI, MIPS,MFLOFS , Amdahl's law and Clock Rate.	CO1	6	May-June 2019

Unit2

Q.No	Question	CO	Marks	University Year
1	List different Addressing modes and explain any two with suitable diagram and example	2	6	May-June 2017/ Nov-Dec 2017
2	Draw diagram of instruction cycle states of a processor and explain.	2	6	May-June 2017/Nov-Dec2017
3	Draw and explain processor organisation.	2	6	May-June 2018

4	Give classification of instruction based on function.	2	6	May-June 2018
5	Explain any four addressing modes with suitable diagram	2	6	Nov-Dec 2016
6	Explain Instruction cycle states with suitable diagram.	2	6	Nov-Dec 2016
7	Explain three addressing mode suitable examples.	CO2	6	May-June 2019
8	Differences between RISC and CISC Architecture.	CO2	6	May-June 2019

Unit3

Q.No	Question	CO	Marks	University Year
1	Draw diagram of single bus processor organization and explain	3	7	May-June 2017/Nov-Dec2017
2	Explain micro-programmed control unit along with block diagram	3	7	May-June 2017
3	Draw and explain hardwired control unit.	3	6	May-June 2018
4	Write control sequence for the execution of the following Instruction ADD (R3) + R1 where R1 _ R1 + (R3).	3	7	May-June 2018 Nov-Dec 2016
5	What are the functions of control unit? Explain control unit with block diagram.	3	7	Nov-Dec 2017
6	Explain sequence of events that occur in Fetch cycle symbolically with diagram at each stage.	3	7	Nov-Dec 2016
7	Draw and explain single bus processor organization.	CO3	6	May-June 2019
8	What is micro instruction? Explain micro-programmed control unit with the help of suitable diagram.	CO3	6	May-June 2019

Unit4

Q.No	Question	CO	Marks	University Year
1	Explain any one type of cache mapping technique with diagram	4	6	May-June 2017/Nov-Dec2017

2	How virtual memory in managed using paging and TLB?	4	6	May-June 2017/ Nov-Dec 2017, 2016
3	Explain MESI protocol with diagram.	4	6	May-June 2018
4	A cache has 256 blocks of 16 words each, memory is 64k words. Find sizes, if cache used : (i) Direct mapping (ii) Fully Associative mapping.	4	7	May-June 2018
5	Explain need of cache memory and direct mapping cache organization technique	4	6	Nov-Dec 2016
6	How virtual memory is managed using paging and TLB?	CO4	6	May-June 2019
7	List and explain cache replacement policy.	CO4	6	May-June 2019

Unit5

Q.No	Question	CO	Marks	University Year
1	What are the hazards in pipeline architecture explain its types.	5	6	May-June 2017/Nov-Dec2017
2	Explain events of execute cycle of MIPS Pipeline.	5	6	May-June 2017
3	Explain events of fetch cycle of MIPS pipeline.	5	6	May-June 2017/ Nov-Dec 2017, 2016
4	What are different stages in 5 stage pipeline.	5	6	May-June 2017/Nov-Dec2017
5	What instruction pipelining? How it improves performance of computer?	5	6	May-June 2018
6	Explain dynamic branch prediction and delayed branch prediction for MIPS pipeline with suitable diagram and example.	5	6	May-June 2018
7	Draw and exaplain 5 stage MIPS pipeline.	5	6	May-June 2018
8	Describe in brief any one pipeline hazard and its solution.	5	6	May-June 2018 Nov – Dec 2016

9	Which are the basic performance issues in pipelining ?	5	6	Nov-Dec 2017,Nov-Dec2016
10	Explain MIPS pipeline with appropriate pipeline registers between each pipeline stage.	5	6	Nov – Dec 2016
11	Explain the basic performance issues of pipelining?	CO5	6	May-June 2019
12	Explain data hazards and control hazards	CO5	7	May-June 2019
13	Write a short note on superscalar processor.	CO5	6	May-June 2019
14	Explain five stage pipelines for MIPS architecture diagram.	CO5	7	May-June 2019

Unit6

Q.No	Question	CO	Marks	University Year
1	What is cluster computing? What are the types of clustering?	5	6	May-June 2017
2	Write note on Multicore Architecture	5	7	May-June 2017/ Nov-Dec 2017
3	Explain closely coupled and loosely coupled microprocessor system.	5	7	May-June 2017 / Nov-
4	Explain Closely coupled and loosely coupled microprocessor system.	CO5	6	May-June 2019
5	Write a short note on Muticore architecture	CO5	7	May-June 2019
6	Write a shrot note on NUMA,UMA,CCNUMA	CO5	6	May-June 2019
7	Explain Fylnns taxonomy for multiple processor organization	CO5	7	May-June 2019
				Dec 2017
4	What are the Flynn's taxonomy for multiple processor organization? Explain with diagram	5	6	May-June 2017 /Nov-Dec2017, 2016
5	Draw and explain multicore architecture.	5	7	May-June 2018
6	What is cluster computing? Explain its benefits.	5	6	May-June 2018
7	Explain multithreading. Describe its various types with suitable diagrams.	5	7	May-June 2018

8	Write short notes on (i) Core Duo (ii) Core-i7.	5	6	May-June 2018
9	Write short note on cluster configuration.	5	6	Nov-Dec 2017
10	Explain Symmetric Multiprocessor (SMP) Organization with Features	5	7	Nov – Dec 2016
11	Explain benefits of clustering and its configurations	5	7	Nov – Dec 2016
12	What is Multicore Computers and explain hardware performance issues of same.	5	6	Nov – Dec 2016

HOME ASSIGNMENT

UNIT NO. 1

Q. No.	Question	CO	Marks	University Year
1	Multiply -7 and 3 using Booths Algorithm.	CO1	6	May-June 2019
2	Describe the computer performance parameters such as CPU time , CPI, MIPS,MFLOFS , Amdahl's law and Clock Rate.	CO1	6	May-June 2019

UNIT NO. 2

Q. No.	Question	CO	Marks	University Year
1	Explain three addressing mode suitable examples.	CO2	6	May-June 2019
2	Differences between RISC and CISC Architecture.	CO2	6	May-June 2019

UNIT NO. 3

Q. No.	Question	CO	Marks	University Year
8	Draw and explain single bus processor organization.	CO3	6	May-June 2019
9	What is micro instruction? Explain micro-programmed control unit with the help of suitable diagram.	CO3	6	May-June 2019

UNIT NO. 4

Q. No.	Question	CO	Marks	University Year
1	How virtual memory is managed using paging and TLB?	CO4	6	May-June 2019
2	List and explain cache replacement policy.	CO4	6	May-June 2019

UNIT NO. 5

Q. No.	Question	CO	Marks	University Year
1	Explain the basic performance issues of	CO5	6	May-June

	pipelining?			2019
2	Explain data hazards and control hazards	CO5	7	May-June 2019
3	Write a short note on superscalar processor.	CO5	6	May-June 2019
4	Explain five stage pipelines for MIPS architecture diagram.	CO5	7	May-June 2019

UNIT NO. 6

Q. No.	Question	CO	Marks	University Year
1	Explain Closely coupled and loosely coupled microprocessor system.	CO5	6	May-June 2019
2	Write a short note on Muticore architecture	CO5	7	May-June 2019
3	Write a shrot note on NUMA,UMA,CCNUMA	CO5	6	May-June 2019
4	Explain Fylnns taxonomy for multiple processor organization	CO5	7	May-June 2019

QUESTION BANK (MCQ)

Unit 1

Q.No	Question	CO	Marks
1	Which kind of architecture is used in EDVAC ? A. Harvard B. VonNeumann C. Both ofthese D. None of these Answer:B	CO 1	1
2	Which kind of number system is used by ENIAC ? A. Decimal B. Binary C. Hex D. Octal E. Answer:A		1
3	Which basic components are used in ENIAC ? A. Vacuumtubes B. Transistor C. IntegratedCircuit D. Gates Answer:A		1
4	How many number of accumulators are used in ENIAC ? A. 10 B. 20 C. 30 D. 40 Answer:B		1
5	Stored program concept is introduced in which type of architecture ? A. Harvard B. VonNeumann C. Both ofthese D. None of these Answer:B		1
6	Which architecture stores program and data in main memory? A. Harvard B. VonNeumann C. Both ofthese D. None of these Answer:B		1

7	Which architecture stores program and data in separate memory? A. Harvard B. VonNeumann C. Both ofthese D. None of these Answer:B		1
8	Which kind of number system is used by IAS ? A. Decimal B. Binary C. Hex D. Octal Answer:B		1
9	What is a size of word in IAS? A. 10 B. 20 C. 30 D. 40 Answer:D		1
10	How many words are present in IAS ?A. 1000 B. 200 C. 2000 D. 100 Answer:A		1
11	What is the size of IAS instructions? A. 30bits B. 20bits C. 10bits D. 5 bits Answer:B		1
12	What is function of MAR ? A. Read/write a word form memory B. Specify an address ofmemory C. Contains the 8-bitop-code D. Store address of nextinstruction Answer:B		1
13	What is function of MBR ? A. Read/write a word form memory B. Specify an address frommemory C. Contains the 8-bitop-code D. Store address of nextinstruction Answer:A		1
14	What is function of PC ? A. Read/write a word form memory B. Specify an address frommemory C. Contains the 8-bitop-code		1

	D. Store address of nextinstruction Answer:D		
15	What is function of IBR ? A. Read/write a word form memory B. Holds the right hand instruction from a word in a memory C. Contains the 8-bitop-code D. Store address of nextinstruction Answer:B		1
16	What is function of IR ? A. Read/write a word formmemory B. Specify an address frommemory C. Contains the 8-bitop-code D. Store address of nextinstruction Answer:C		1
17	Which register pair holds the result of multiplication operation? A. AC,MQ B. MQ,AC C. AC,PC D. PC,AC Answer:A		1
18	What is function of Accumulator? A. Read/write a word form memory B. Specify an address frommemory C. Holds the result of arithmetic and logicaloperations D. Store address of nextinstruction Answer:C		1
19	Which are the basic data types of computer? A. Fixed and floating pointnumbers B. Fixed, Floating andCharacter C. Floating andCharacter D. None of these Answer:A		1
20	Which bit represents the sign of a number in sign magnitude representation? A. MSB B. LSB C. Both a andb D. None of these Answer:A		1
21	Which representation is commonly used by computer? A. Sign Magnituderepresentation B. 1's complementrepresentation C. 2's complementrepresentation D. 9's complementrepresentation Answer:C		1

22	What is the range of 8-bit sign binary number? A. -127 to+127 B. -128 to+127 C. -127 to+128 D. +127 to-127 Answer:B		1
23	In Booth's algorithm, if Q0=0 and Q-1=0 then it will perform which operation, A. A=A-M B. A=A+M C. Arithmetic right shift of A, Q andQ-1 D. A=M-A Answer:C		1
24	In Booth's algorithm, if Q0=1 and Q-1=0 then it will perform which operation, A. A=A-M B. A=A+M C. Arithmetic right shift of A, Q andQ-1 D. A=M-A Answer:A		1
25	In Booth's algorithm, for Multiplier=1000 and Multiplicand=1100. How many number of cycles are required to get the correct multiplication result? A. 4 B.5 C.3 D.6 Answer:A		1
26	In Booth's algorithm, for Multiplier=10000 and Multiplicand =1100101. How much number of cycles are required to get the correct multiplication result? A. 4 B.5 C.3 D.6 Answer:B		1
27	In Booth's algorithm, for Multiplier=10000 and Multiplicand =1100101.What will be the size of A register? A. 4 B.5 C.3 D.6 Answer:B		1
28	What will be the result of Booth recoding operation on 0011110? A. 0+1000-10 B. 0+1000+10		1

	C. 0+10000 D. 0-1000-10 Answer:A		
29	What version of multiplicand will be selected if consecutive multiplier bits are 00? A. 0*M B. +1*M C. -1*M D. 2*M Answer:A		1
30	In booth recoding, M is multiplicand and -1 is booth recoded multiplier, then what will be the result of multiplication? A. 1's complement ofM B. 2's complement ofM C. M D. Right shift ofM E. Answer:B		1

Unit 2

Q.No	Question	CO	Marks
1	Which is the fastest memory in computer system? A. Registers B. RAM C. ROM D. Cache ANSWER:D	CO 2	1
2	What are the basic components of the CPU? A. Registers B. ALU and ControlUnit C. DMA D. Both a and b ANSWER:D		1
3	What is mean by op-code? A. Operationcode B. Outputcode C. Organizedcode D. Optional code ANSWER:A		1
4	What are the sources of the operand? A. Mainmemory B. CPU registers and I/Odevices C. CPU register andALU D. Both a andb		1

	ANSWER:D		
5	What is the function of data movement instructions? A. Processing ofdata B. Movement ofdata C. Mange the program flow control D. Both a and b ANSWER:B		1
6	Which of the following is a memory addressing mode? A. Registeraddressing B. Directaddressing C. In-directaddressing D. Both b and c ANSWER:D		1
7	Which of the following is a memory addressing mode? A. Registeraddressing B. Directaddressing C. Immediate addressing D. None of these ANSWER:B		1
8	In which of the following addressing modes one of the operand is data? A. Registeraddressing B. Directaddressing C. Immediate addressing D. None of these ANSWER:C		1
9	The load instruction is mostly used to designate a transfer from memory to a processor registerknownas_____. A. Accumulator B. InstructionRegister C. Programcounter D. Memory addressRegister ANSWER:A		1
10	_____register keeps tracks of the instructions stored in program stored inmemory. A. AR (AddressRegister) B. XR (IndexRegister) C. PC (ProgramCounter) D. AC (Accumulator) ANSWER:C		1
11	When CPU is executing a Program that is part of the Operating System, it is said tobein_____. A. Interruptmode B. Systemmode C. Halfmode D. Simplexmode		1

	ANSWER:B		
12	An instruction used to set the carry flag in a computer can be classified as A. DataTransfer B. ProcessControl C. Logical D. None of these ANSWER:B		1
13	An instruction used to set the carry flag in a computer can be classified as A. Datatransfer B. Processcontrol C. Logical D. None of these ANSWER:B		1
14	In a generic microprocessor instruction cycle time is A. Shorter than machine cycletime B. Larger than machine cycletime C. Ten times the machine cycletime D. Exactly the same as the machine cycletime ANSWER:D		1
15	A basic instruction that can be interpreted by a computer generally has A. An operand and anaddress B. A decoder and anaccumulator C. Sequence register anddecoder D. None of these ANSWER:A		1
16	The CPU of a Computer takes instruction from the memory and executes them. This process is called A. Loadcycle B. Timesequence C. Fetch-execute cycle D. None of these ANSWER:C		1
17	A stack is a A. 32-bit register in themicroprocessor B. 16-bit register in themicroprocessor C. set of memory locations in R/W memory reserved forstoring information temporarily during heexecution of aprogram D. 16-bit memory address stored in the h programcounter ANSWER:C		1
18	Both the arithmetic logic unit (ALU) and control section of CPU employ special purpose storage locations called A. Decoders B. Buffers		1

	C. Demultiplexer D. Registers ANSWER:D		
19	The unit of a computer system which executes program, communicates with and often controls the operation of other subsystems of the computer is the A. CPU B. Controlunit C. Both (a) and(b) D. Peripheral unit ANSWER:A		1
20	What is the control unit function in the CPU? A. To transfer data to primarystorage B. To store programinstruction C. To perform logicoperations D. To decode programinstruction ANSWER:D		1
21	A machine language instruction format consists of A. Operandfield B. Operation code field C. Operation code field & operandfield D. none of the mentioned ANSWER:C		1
22	The length of the one-byte instruction is A. 2bytes B. 1byte C. 3bytes D. 4 bytes ANSWER:B		1
23	The instruction "JUMP" belongs to A. sequential control flowinstructions B. control transferinstructions C. branchinstructions D. control transfer & branchinstructions ANSWER:D		1
24	PC Program Counter is also called ……. A) instructionpointer B) memorypointer C) datacounter D) file pointer ANSWER:A		1
25	CPU does not perform the operation …… A) datatransfer B) logicoperation		1

	C) arithmetic operation D) all of the above ANSWER:A		

Unit III

Q.No	Question	CO	Marks
1.	Individual bits in control word represents various control signals A. True B. False	CO - 3	1
2.	Individual control words in a microroutine are called A. Controlword B. Microroutine C. Microinstruction D. Micropath		1
3.	Latency is an initial delay from the initiation of an operation to the time the first data is available A. True B. False		1
4.	MFC stands for A. Memory FormatCaches. B. Memory FunctionComplete. C. Memory FindCommand. D. Mass FormatCommand.		1
5.	Rin control signal used to load the register with data from bus A. True B. False		1
6.	The condition flag Z is set to 1 to indicate A. The operation has resulted in anerror B. The operation requires an interrupt call C. The result iszero D. There is no empty registeravailable		1
7.	The Instruction fetch phase ends with A. Placing the data from the address in MAR intoMDR B. Placing the address of the data intoMAR C. Completing the execution of the data and placingits storage address intoMAR D. Decoding the data in MDR and placing it inIR		1
8.	The sequence of steps corresponding to the control sequence of machine instruction is the A. Controlword B. Microroutine C. Microinstruction		1

	D. Micropath		
9.	This microinstruction encoding, requires much smaller word size in control memory and it supports strictly sequential execution of microinstructions. A. Horizontalencoding B. Verticalencoding C. Diagonalencoding D. None		1
10.	While using the iterative construct inexecution,_____instruction is used to check the condition. A. TestAndSet B. Branch C. TestCondn D. None of theabove		1

Unit - IV

Q.No	Question	CO	Marks
1	During a write operation if the required block is not present in the cache ... A. Writelatency B. Write hit C. Write delay D. Writemiss		1
2	In_____locality, recently executed instructions are likely tobe executed again very soon A. TemporalLocality B. SpatialLocality		1
3	The fastest data access isprovidedusing_____. A. Caches B. Registers	CO 4	1
4	The key factor/s in commercial success of a computer is/are _____. A. Performance B. Cost C. Speed D. Both Speed and Cost		1
5	The larger memory placed between the primary cache andthe memoryiscalled_____. A. Level 1cache B. Level 2cache C. EEPROM		1

	D. TLB		
6	The main purpose of having memory hierarchy is to A. Reduce access time. B. Provide largecapacity. C. Reduce propagationtime. D. Both a andb		1
7	The memory blocks are mapped on to the cache with the help of_____. A. Hashfunctions B. Vectors C. Mappingfunctions D. None of theabove		1
8	While using the direct mapping technique, in a 16 bit system the higher order 5 bits isusedfor_____. A. Tag B. Block C. Word D. Id		1
9	___is probability that a logical address generated by the CPU refers to information stored inM1 A. MissPenalty B. Missratio C. Hitratio D. MissRate		1
10	_____is technique used by the operating system to provide an illusion of very large memory to theprocessor A. Cache Memory B. Secondarymemory C. VirtualMemory D. None		1

ADDITIONAL RESOURCES

- **NPTEL Online Course - Computer Organization &Architecture**

214443

Digital Electronics and Logic Design

SYLLABUS

214443: DIGITAL ELECTRONICS AND LOGIC DESIGN

Teaching Scheme:	Credits	Examination Scheme:
Lectures: 4 Hours/Week	04	In-Semester(Online): 50 Marks
		End-Semester: 50 Marks

UNIT – INUMBER SYSTEM AND LOGIC FAMILIE 8 Hours

Introduction to digital electronics & Boolean algebra.Number Systems - Binary, Octal, Hexadecimal and their conversions.Signed Binary number representation and Arithmetic's: Signed & True Magnitude, 1's complement,2's complement representation and arithmetic's.Codes: BCD, Excess-3, Gray code, Binary Code and their conversion.

Switching characteristics of BJT & FET, IC Characteristics.TTL: Standard TTL characteristics, Operation of TTL NAND gate, Subfamilies, Configurations-Activepull-up, Wired AND, totem pole, open collector.CMOS: Standard CMOS characteristics, operation of CMOS NAND, Subfamilies, CMOSconfigurations Wired Logic, Open drain outputs.Comparison of TTL & CMOS, Interfacing: TTL to CMOS and CMOS to TTL

UNIT – IICOMBINATIONAL LOGIC DESIGN8 Hours

Logic minimization: Representation of truth-table, SOP form, POS form, Simplification of logicalfunctions, Minimization of SOP and POS forms, don't care Conditions.

Reduction techniques: K-Maps up to 4 variables and Quine - McCluskytechnique.CLC design using SSI chips – Code converters, Half- Adder, Full Adder, Half Subtractor, Full Subtractor,n bit Binary adder, Look ahead carry generator.Magnitude comparator using IC 7485.Introduction to MSI functions & chips - Multiplexers (IC 74151 and IC 74153), Decoder / Demultiplexer(IC 74138), Encoder (IC 74147), Binary adder (IC 7483).CLC design using MSI chips – BCD & Excess 3 adder &subtractor using IC7483, Implementation oflogic functions using IC 74151,74153& 74138.

UNIT – IIISEQUENTIAL LOGIC 8 Hours

Introduction to sequential circuits. Difference between combinational circuits and sequential circuits, memory element – latch.Flip- Flops: Design, truth table, excitation table of SR, JK, D, T flip flops. Study of flip flops withasynchronous and synchronous Preset & Clear, Master Slave configuration, conversion from one type to another type of flip flop. Study of flip flop ICs - 7473, 7474, 7476

Application of flip-flops – Bounce elimination switch, Counters- asynchronous, synchronous andmodulo counters study of modulus n counter ICs- 7490, 74191 & their applications to implement mod counters.

UNIT – IVSEQUENTIAL LOGIC DESIG 8 Hours

Registers- Buffer register, shift register types - SISO, SIPO, PISO & PIPO, applications of shift registers -ring counter, twisted ring counter, study of universal shift register IC – 74194,

Sequence generators using counters & shift register, Pseudo Random Binary Sequence Generator. Basic design steps-State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, sequence detector using Moore & Mealy model.

UNIT – VPROGRAMMABLE LOGIC DEVICES AND

INTRODUCTION TO HDL6 Hours

Algorithmic State Machines- ASM notations, charts (eg- counters, washing machine, lift controller,vending machine), design using multiplexer controller method (eg- counters).

Introduction to PLD's – ROM, PAL, PLA, Design of 4 variable SOP using PLDs, Basic architecture of SPLDand CPLD, Study of CPLD architecture XC9572, Basic architecture of FPGA, CPLD. Design flow (Basic Concept of Simulation and Synthesis)Introduction to HDL – Necessity, Characteristics & Types.

UNIT – VI VHDL PROGRAMMING6 Hours

Introduction to VHDL - Library, Package, Entity, Architecture, Data Objects (Variable, signal &constant), Data Types (scalar, composite array type & predefined data types, Attributes (necessity and use. 'event attribute). VHDL Modeling styles – Dataflow, behavioral & structuralVHDL statements - Concurrent Statements (With. Select, When..Else), Sequential Statements (if..else,case)VHDL design Examples - Multiplexer, binary adder, counter, shift register.

Text Books

1.**"**Modern Digital Electronics ", R.P. Jain, 3rd Edition, Tata McGraw-Hill, ISBN: 0–07–049492–

2."Fundamentals of Digital Logic with VHDL Design", Stephen Brown, ZvonkoVranesic McGraw-Hill, ISBN: 978–0–07–352953–0

Reference Books

1."Digital Principles", Flyod, Pearson EducationISBN:978-81- 7758-643-6.

2."Digital Design", M Morris Mano, Prentice Hall, 3rd Edition, ISBN: 0130621218.

3."Digital Logic applications and Design", John Yarbrough, Thomson Publication ISBN: 978-0314066756

4."Digital Principles and Applications", Malvino, D. Leach, 5th edition, Tata McGraw Hill

5."VHDL Primer", J.Bhaskar, Pearson Education,3rd Edition, ISBN: 0071226249

6."Switching and Finite Automata Theory", Kohavi Z., Jha N.K,, Cambridge University Press, India, 2nd Edition, ISBN: 978-0-521-85748-2

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit	Assessment Technique	Blooms Taxonomy Category
C214443.1	Make use of Number System,Boolean Algebra and codes knowledge for the logic gate design	I	MCQ Test	Applying
C214443.2	Design of K-map to develop various combinational logic design circuits.	II	MCQ Test	Creating
C214443.3	Analyze sequential circuits and their use in various application	III, IV	MCQ Test	Analyzing
C214443.4	Identify the digital circuits Input/outputs to replace by FPGA.	V	EndSem(Theory Test)	Applying
C214443.5	Experiment with VHDL programmed technique with different modeling stylesfor any digital circuits.	VI	EndSem(Theory Test)	Applying

PREREQUISITES

Sr. No.	Unit Number	Prerequisite subject name
1.	I	Basic Electronics Engineering, Basic Mathematics
2.	II	Basic Electronics Engineering, Basic Mathematics
3.	III	Basic Electronics Engineering, Basic Mathematics
4.	IV	Basic Electronics Engineering, Basic Mathematics
5.	V	Basic Electronics Engineering, Basic Mathematics, C Programming
6.	VI	Basic Electronics Engineering, Basic Mathematics, C Programming

TEACHING PLAN

Teaching Plan Short

Academic Year:- 2019-20 Semester :- I w. e. f. :- 15/06/2019

Class : - SE Division: A/B

Subject :- Digital Electronics and Logic Design Subject Code :- 214443

Faculty In charge :-Ms. Sonali Deo/ Mrs. PoonamRakibe No. of Lectures/ weeks: 4

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start week	End week
1.	I	Number System And Logic Families	June 3rd week	June 4th week
2.	II	Combinational Logic Design	July 1st week	July 2nd week
3.	III	Sequential Logic	July 3rd week	July 5th week
4.	IV	Sequential Logic Design	August 1st	August 2nd week
5.	V	Programmable Logic Devices and Introduction to VHDL	August 2nd week	August 4th week
6.	VI	VHDL Programming	September 1st week	September 3rd week

Detail Teaching Plan

Lect. No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO to Attain	Measurable to attain CO	Mode of Delivery
1	I	NUMBER SYSTEM AND LOGIC FAMILIES	Introduction to digital electronics & Boolean algebra. Number Systems - Binary, Octal, Hexadecimal and their conversions.	Digital Principles", Flyod, Pearson EducationISBN:978-81-7758-643 Digital Principles", Flyod, Pearson EducationISBN:978-81-7758-643	C214443.1	MCQ Test	Chalk & Talk
2		Signed Binary number representation and Arithmetic's	: Signed & True Magnitude, 1's complement, 2's complement representation and arithmetic's.				Chalk & Talk
3		Codes	: BCD, Excess-3, Gray code, Binary Code and their conversion.				Chalk & Talk
4		TTL	Switching characteristics of BJT & FET, IC Characteristics. Standard TTL characteristics,				Chalk & Talk
5			Operation of TTL NAND gate, Subfamilies,				Chalk & Talk
6			Configurations-Active pull-up, Wired AND, totem pole,				Chalk & Talk

			open collector.				
7		CMOS	: Standard CMOS characteristics, operation of CMOS NAND, Subfamilies				Chalk & Talk
8			CMOS configurations Wired Logic, Open drain outputs. Comparison of TTL & CMOS, Interfacing: TTL to CMOS and CMOS to TTL				
9			Assessment Technique				
10	II	COMBINATIONAL LOGIC DESIGN Logic minimization	: Representation of truth-table, SOP form, POS form, Simplification of logical functions, Minimization of SOP and POS forms, don't care Conditions.	"Digital Principles", Flyod, Pearson EducationISBN:978-81-7758-643-6	C214443.2		
11			Minimization of SOP and POS forms, don't care Conditions.				
12		Reduction techniques	: K-Maps up to 4 variables and Quine - McClusky technique.				
13		CLC design using SSI chips	– Code converters, Half-Adder, Full Adder, Half Subtractor, Full Subtractor				
14			n bit Binary adder, Look ahead carry generator.Magnitue comparator using IC 7485.				

15		Introduction to MSI functions & chips	- Multiplexers (IC 74151 and IC 74153), Decoder / Demultiplexer				Chalk & Talk
16			(IC 74138), Encoder (IC 74147), Binary adder (IC 7483).				
17		CLC design using MSI chips –	BCD & Excess 3 adder &subtractor using IC 7483, Implementation of logic functions using IC 74151,74153& 74138.				
18			Assessment Technique 2			MCQ Test	
19	III	SEQUENTIAL LOGIC	Introduction to sequential circuits. Difference between combinational circuits and sequential circuits,	"Digital Logic applications and Design", John Yarbrough, Thomson Publication ISBN: 978-0314066756 4. "Digital Principles and Applications", Malvino, D. Leach, 5th edition, Tata McGraw Hill	C214443.3 C214443.4		
20		Memory element –	latch. Flip- Flops: Design, truth table,				
21			Excitation table of SR, JK, D, T flip flops.				
22			Study of flip flops with asynchronous and synchronous Preset & Clear, Master Slave configuration, conversion from one type to another type of flip flop.				
			Study of flip flop ICs - 7473, 7474, 7476				Chalk & Talk
23		Application of flip-flops	Bounce elimination switch				
24			Counters- asynchronous, synchronous and				

25			modulo counters study of modulus n counter ICs- 7490, 74191 & their applications to implement mod counters				
26			Assessment of Unit III			MCQ Test	
27	IV	SEQUENTIAL LOGIC DESIGN Registers-	Buffer register	"Digital Logic applications and Design", John Yarbrough, Thomson Publication ISBN: 978-0314066756 4. "Digital Principles and Applications", Malvino, D. Leach, 5th edition, Tata McGraw Hill	C214443.3		
28		shift register types	- SISO, SIPO, PISO & PIPO				
29			applications of shift registers - ring counter, twisted ring counter,				
30			study of universal shift register IC – 74194				
31			Sequence generators using counters & shift register, Pseudo Random Binary Sequence Generator.				Chalk & Talk
32		Basic design steps-	State diagram, State table, State reduction, State assignment				
33			Mealy and Moore machines representation, Implementation				
34			finite state machine implementation,				
35			sequence detector using Moore & Mealy model.				
36			Assessment of Unit IV			MCQ Test	

37	V	PROGRAMMABLE LOGIC DEVICES AND INTRIDUCTION TO HDL	Introduction to VHDL - Library, Package, Entity, Architecture, Data Objects (Variable, signal & constant),	"VHDL Primer", J.Bhaskar, Pearson Education,3rd Edition, ISBN: 0071226249	C214443.4		PPT
38			design using multiplexer controller method (eg- counters).				
39		Introduction to PLD's –	ROM, PAL, PLA, Design of 4 variable SOP using PLDs, Basic architecture of SPLD and CPLD				
40			Study of CPLD architecture XC9572.				
41			Basic architecture of FPGA, CPLD.				
42			Design flow (Basic Concept of Simulation and Synthesis)				PPT & Simulation in Xilinx
43		Introduction to HDL –	Necessity, Characteristics & Types.				
44			Assessment of Unit V			End Sem (Theory Test	
45	VI	VHDL PROGRAMMING Introduction to VHDL	Library, Package, Entity, Architecture, Data Objects (Variable, signal & constant),	"VHDL Primer", J.Bhaskar, Pearson Education,3rd Edition, ISBN: 0071226249	CO5		
46			Data Types (scalar, composite array type & predefined data types, Attributes (necessity and use. event attribute)				
47		VHDL Modeling styles –	Dataflow, behavioral & structural				

48			behavioral, structural				
49		VHDL statements –	Concurrent Statements (With. Select, When. Else)				
50			Sequential Statements (if. Else, case)				
51		VHDL design Examples -	Multiplexer, binary adder, counter, shift register				

UNIT WISE QUESTION BANK

Unit I

Sr. No.	Question	CO No.	Marks	University Year
1	1. Do the required conversions for the following numbers: $(BF8)_{16}$ = ( ) 10 $(1000)_{10}$= ( ) 8 $(377)_8$= ( ) 16 $(1010.11)_{10}$= ( ) 2 $(11100011101)_2$= ( ) 10 $(85.7)_{16}$= ( ) 8	1	6	
2	Define the following terms related to logic family: Propagation delay Fan out VIL, VIH Noise margin	1	4	
3	Compare TTL and CMOS logic family	1	4	DEC 2014
4	Draw and Explain TTL NAND gate?	1	2	MAY 2016
5	Draw and Explain CMOS NAND gate?	1	4	
6	What will be the grey code for any binary number?	1	2	
7	1. Apply Boolean algebra and minimize the following equations $A+A\bar{B}D+AC$ $A+BC+A\bar{D}$	1	4	
8	Compare Totem pole output and open collector output in TTL	1	4	
9	Convert the following number into its equivalent hexadecimal, decimal and binary number 1. (357.2)8 2. (453.54)8		6	May2014
10	Convert decimal 27 into following: 1)Binary 2)Excess-3 3)Gray 4)HEX	1	6	May 2016

Unit II

Sr. No.	Question	CO No.	Marks	University Year
1	Solve the following functions using K-MAP F (A, B, C, D) = πM(0,1,6,7,8) F (A,B,C,D) = ∑m(2,4,8,10,11) + d(3,5)	2	6	
2	Draw and explain 4 bit BCD adder using IC 7483?	2	6	
3	Design 12: 1 MUX using 4: 1 MUX	2	4	
4	Implement the following Boolean function using 4:1 MUX F (A, B, C, D) = A+ABD+ABC+AB+D	2	6	
5	Design full adder using suitable decoder?	2	6	Dec 2013
6	Implement the following Boolean function using 1:8 DEMUX F (A, B, C, D) = A+ABD+AB+A	2	2	
7	Design Full Subtractor using Decoder IC 74138	2	6	Nov.15
8	Design Full Adder using 4:1 MUX	2	4	Dec2014
9	Draw and Explain the look ahead carry generator	2	6	May2014
10	Design using single $:1 multiplexer and logic gates: F(A,B,C,D)=∑(0,2,5,8,10,15)	1	6	May 2016

Unit III

Sr. No.	Question	CO No.	Marks	University Year
1	What is race around condition? How it can be avoided?Convert T flip flop into D flip flop		6	
2	Explain difference between sequential and combinational circuits? Design SR flip flop using JK flip flop?		6	
3	Draw and explain 3-bit asynchronous UP counter. Also draw the necessary timing diagram. Compare between synchronous counter and asynchronous counter?		4	
4	Design the following using IC7490 : (i) MOD 97 counter (ii) MOD 45 counter.		6	
5	What is MOD counter? Draw the internal structure of IC 7490. Design MOD 56 counter using IC 7490 & necessary logic gates		6	
6	Draw and explain the working of master slave JK flip flop. Draw excitation table of JK flip flop		6	
7	What is SR-flip-flop? Convert the basic SR-flip-flop (SR-FF) into : (i) JK-FF (ii) T-FF (iii) D-FF.		6	
8	What is the difference between synchronous counter and asynchronous counter? Design 3-bit synchronous up-counter using MS JK-flip-flop		4	
9	Design MOD-11 up counter using IC 74191		6	Nov2015
10	Design JK flipflop using SR flipflop		6	Dec2014

Unit IV

Q.No	Question	CO	Marks	University Year
1	Explain with a neat diagram ring counter	4	6	May – June 2017
2	Design Sequence generator to generate the sequence 1011 using shift register IC74194		6	May – June 2017
3	Draw and explain 4 bit Ring counter. Write the truth table for the same showing all possible states if initial state is 1100		6	May – June 2018
4	Draw and explain 4 bit SISO and SIPO shift register. Give applications of each.		6	May – June 2018
5	Design Sequence generator to generate the sequence 1101011 using shift register IC74194		6	Nov – Dec 2016

Unit V

Q.No	Question	CO	Marks	University Year
1	Design Full Adder using PLA	5	7	May – June 2017
2	Compare CPLD and FPGA		6	May – June 2017
3	Explain architecture of CPLD with the help of suitable diagram		6	May – June 2017
4	Draw the ASM chart for 2 bit binary Up/DOWN counter with control input M such that if M = 0 counter counts in up direction and if M = 1, counter counts in down direction. Design the same using MUX controller Method using D Flip-flops.		7	May – June 2017
5	Draw ASM chart for 2 bit binary up counter with mode control input M such that For M = 1 counter counts up, For M = 0 counter holds present Design the circuit using multiplexer controller method.		7	May – June 2018
6	Design 4:1 MUX using suitable PAL	5	6	May – June 2018
7	Draw and explain Internal Architecture of CPLD in Detail		6	May – June 2018
8	Draw and explain Johnson counter with initial state 1110 from initial state. Explain all possible states		6	Nov – Dec 2016

9	Explain difference between PAL and PLA?			
10	Explain difference between FPGA and CPLD?			
11	Design the following function using PLA F1 = ∑m(1,2,4,6) F2 = ∑m(5,7) F3 = ∑m(1,4,3)			
12	State the characteristics of HDL.			
13	Explain BCD to Excess – 3 code converter using suitable PLA		7	Nov – Dec 2016

Unit VI

Q.No	Question	CO	Marks	University Year
1	Explain VHDL modeling styles with example	5	7	May – June 2017
2	Write VHDL program for 3:8 decoder		6	May – June 2017
3	What is VHDL? Write features of VHDL. Explain the structure of VHDL module. Define entity and architecture for 2 – input OR gate.		7	May – June 2017
4	Explain the difference between concurrent and sequential statements with an example		6	May – June 2017
5	What is VHDL? Write features of VHDL. Explain the components of VHDL module. Define entity and architecture for 2 – input AND gate.			May – June 2018
6	Write VHDL code for 4: 1 multiplexer using Dataflow Model		7	May – June 2018
7	Explain the entity and architecture in VHDL with syntax and example?			
8	Explain the process statement in behavioral model of VHDL with respect to syntax, sensitivity list, declarative part and statement part?			
9	Explain the difference between VHDL modeling styles?			
10	Explain the statements in VHDL with suitable example– Signals, Process		7	Nov – Dec 2016
11	What are the important features of VHDL? Write VHDL code			

	for 4: 1 multiplexer in Behavioral and Data flow modeling?			
12	Write the VHDL code for full adder in structural and data flow modeling styles.			
13	Explain the following statements used in VHDL with suitable examples: (1) Process (2) case (3) If then Else (4) Signal assignment			
14	Write VHDL description of full substractor using dataflow and structural modeling.			
15	What is difference between signal and variable in VHDL? Explain with example.			

Unit Wise Home Assignment

Unit I

Sr. No.	Question	CO No.	Marks	University Year
1	Convert the following numbers into its equivalent decimal number.(show step by step process of conversion) 1. $(357.2)_8$ 2. $(458.54)_8$ **Identify** equivalent decimal numbers for following octal numbers. (show step by step process of conversion) 1. $(357.2)_8$ 2. $(458.54)_8$	1	6	May 2014
2	Subtract $(7F)_{16}$-$(5C)_{16}$ using 2's complement method **Solve** $(7F)_{16}$-$(5C)_{16}$ using 2's complement method	1	6	May 2017
3	Explain any three characteristics of Digital IC. **Identify** any three characteristics of Digital IC.	1	6	May 2017
4	Do the following conversion 1. $(27.125)_{10}=()_2$ 2. $(25)_{10}=()_2$ **Apply** rule convert decimal to binary and **solve** following conversions 1. $(27.125)_{10}=()_2$ 2. $(25)_{10}=()_2$	1	4	Dec 2016, May 2018
5	Prove that NAND and NOR are universal gates **Prove that** NAND and NOR can be called as universal gates	1	4	

Unit II

Sr. No.	Question	CO No.	Marks	University Year
1	Minimize the following equation using K-map and realize using logic gates: **Minimize** the following equation using K-map and **Design** using logic gates: f(A,B,C,D)=$\Sigma m(1,3,7,11,15) + d(0,2,5)$	2	4	Dec 2013
2	Reduce the following using K-map techniques. **Modify** following function using K-map techniques so as to get minimized equation . F(A,B,C,D)=$\Pi M(0,2,3,8,9,12,13,15)$	2	4	Dee 2014

3	Reduce equation using Quine McCluskey method and realize circuit using basic gates. **Minimize** equation using Quine McCluskey method and **design** circuit using basic gates. F(A,B,C,D)= $\Sigma m(1,5,6,12,13,14) + d(2,4)$	2	6	May 2014
4	Use Quine McCluskey method. Determine minimal Sop form for **Construct** new equation for the following equation using Quine McCluskey method. F(A,B,C,D)= $\Sigma m(1,3,7,8,9,11,15)$	2	6	May 2017
5	Draw and explain look ahead carry generator. **Discuss** concept of look ahead carry generator.		6	May 2014

Unit III

Sr. No.	Question	CO No.	Marks	University Year
1	Draw and explain 1-bit memory cell. **Explain** working of 1-bit memory cell.	3	3	Dec 2018
2	Draw J-K Flip Flop using Gates **Build** J-K Flip Flop using Gates.	3	3	May 2019
3	**What** is race around condition? **Explain** with the help of timing diagram. **How** is it removed using Flip-flop.	3	6	May 2015, Dec 2015, May 2019
4	**Design** J-K Flip flop using SR Flip flop.	3	4	Dec 2014
5	Convert JK to T Flip flop. **Construct** T Flip flop to JK Flip Flop.	3	6	May 2018

Unit IV

Sr. No.	Question	CO No.	Marks	University Year
1	Explain with neat diagram working of 3 bit directional shift register.	3	6	Dec 2013
2	Draw & explain 3 bit ring counter.	3	6	Nov 2015
3	Draw state diagram to detect sequence 101 using mealy modelling style.	3	6	Dec 2018,
4	Draw sequence generator to generatesequence 1101011 using IC74194.	3	6	Dec 2016
5	Draw & explain 4 bit SIPO shift register	3	3	May 2018

Unit V

Sr. No.	Question	CO No.	Marks	University Year
1	Design the following functions using PLA. F1=∑m(1,3,5) F2=∑m(5,6,7)	4	6	November 2015
2	How would you show difference between CPLD & FPGA	4	6	May 2018
3	Can you give comparison between PLA & PAL with respect to architecture flexibility & advantages disadvantages	4	6	May 2016
4	Present BCD to excess-3 code converter using suitable PLD	4	6	May 2015
5	Draw basic structure of FPGA.Explain its features.Explain its features in brief.	4	6	May 2015

Unit VI

Sr. No.	Question	CO No.	Marks	University Year
1	Present the structure of VHDL module & explain various components of it.	5	3	Dec 2018
2	How will you explain difference between sequential & concurrent statements used in VHDL with suitable examples.	5	6	May 2019
3	Write VHDL code for half adderusing structural modelling style.	5	7	Dec 2018
4	Write VHDL code for for 4:1 multiplexer using dataflow	5	7	May 2018
5	What is VHDL?how would you explain components of VHDL in detail in detail with example of 2 input AND gate	5	6	May 2018

QUESTION BANK (MCQ)

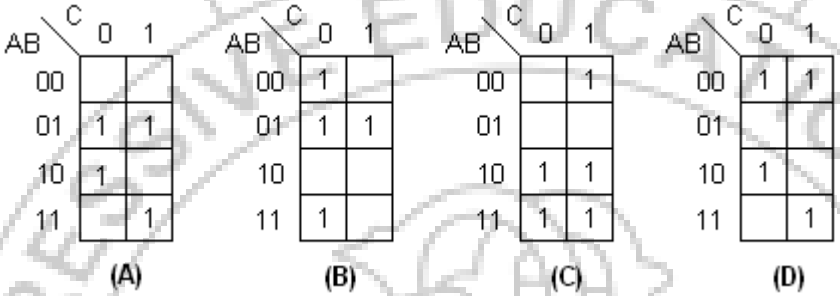
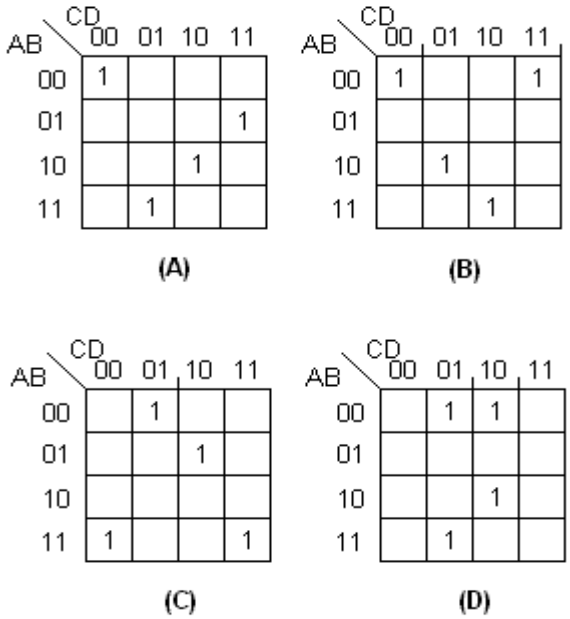
Unit I

Sr. No.	Question	CO No.	Mark
1	Convert the fractional binary number 0000.1010 to decimal. Select one: a. 0.55 b. 0.10 c. 0.625 d. 0.50	CO1	1
2	Fan-out is specified in terms of _____. Select one: a. wattage b. current c. voltage d. unit loads	CO1	1
3	Give the decimal value of binary 10010. Select one: a. (18)10 b. (6)10 c. (20)10 d. (9)10	CO1	1
4	Hexadecimal letters A through F are used for decimal equivalent values from: Select one: a. 1 through 6 b. 11 through 16 c. 9 through 14 d. 10 through 15	CO1	1
5	The 1's complement of 10011101 is _____. Select one: a. 01100011 b. 01100001 c. 10011110 d. 01100010	CO1	1
6	The gray code equivalent of (1011)_2 is Select one: a. 1111 b. 1010. c. 1110 Correct d. 1101	CO1	1
7	The output of an AND gate is LOW _____. Select one:	CO1	1

	a. when all inputs are HIGH b. all the time c. when any input is HIGH d. when any input is LOW		
8	The term "hex inverter" refers to: Select one: a. an inverter that has a history of failure b. six inverters in a single package c. an inverter that has six inputs d. a six-input symbolic logic device	CO1	1
9	TTL operates from a _____. Select one: a. 12-volt supply b. 5-volt supply c. 9-volt supply Incorrect d. 3-volt supply	CO1	1
10	What is the circuit number of the IC that contains four two-input AND gates in standard TTL? Select one: a. 7432 b. 7402 c. 7408 d. 7404	CO1	1
11	Which of the following logic families is well suited for high speed operations? Select one: a. TTL b. MOS c. CMOS Incorrect d. ECL	CO1	1

Unit II

Sr. No.	Question	CO No.	Mark
1	A combinational logic circuit which sends data coming from a single source to two or more separate destinations is Select one: a. Decoder b. Demultiplexer c. Encoder d. Multiplexer	CO2	1
2	A half adder has	CO2	1

	Select one: a. None of the above. b. 2 inputs and 2 outputs c. 2 inputs and 3 outputs d. 3 inputs and 3 outputs		
3	Mapping the SOP expression $\bar{A}\bar{B}\bar{C}+\bar{A}B\bar{C}+\bar{A}BC+AB\bar{C}$, we get _____.  A (A) B (B) C (C) D (D) **AnsB**	CO2	2
4	Mapping the standard SOP expression $AB\bar{C}\bar{D}+\bar{A}\bar{B}CD+A\bar{B}\bar{C}D+\bar{A}\bar{B}\bar{C}\bar{D}$, we get  	CO2	2

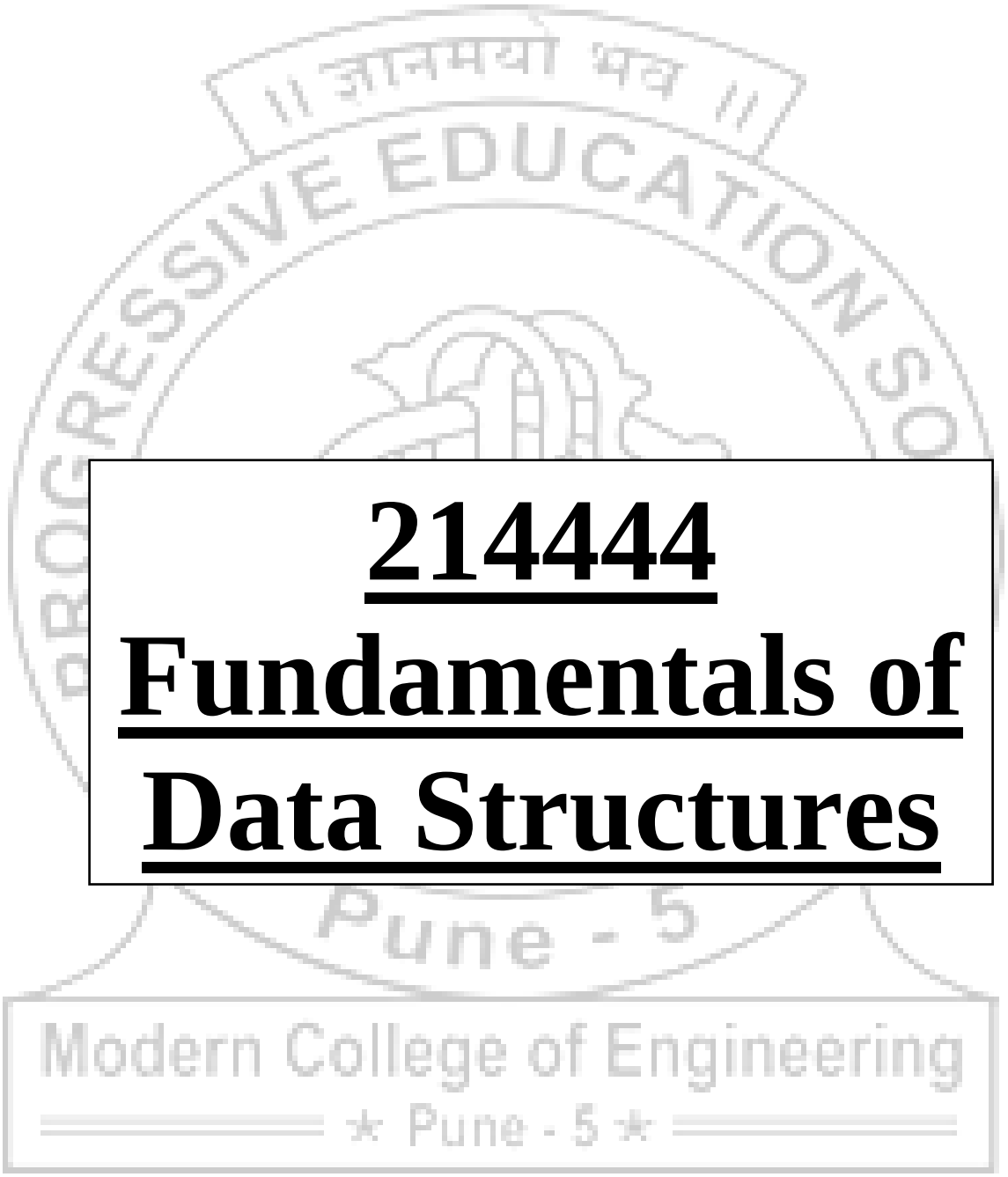
	A. (A) B. (B) C. (C) D. (D) **AnsB**		
5	A technique to speed parallel addition by eliminating the delay caused by the carry bit propagation is called fast carry, or look-ahead carry. Select one: a. True b. False	CO2	1
6	If a logic gates has four inputs, then total number of possible input combinations is Select one: a. 4 b. 8 c. 32 d. 16	CO2	1
7	The format used to present the logic output for the various combinations of logic inputs to a gate is called a(n): Select one: a. Boolean constant b. Boolean variable c. truth table d. input logic function	CO2	1
8	The gates required to build a half adder are Select one: a. EX-OR gate and NOR gate b. Four NAND gates. c. EX-OR gate and AND gate Correct d. EX-OR gate and OR gate	CO2	1
9	Which combinational circuit that performs subtraction involving three bits ? Select one: a. Full subtractor. Correct b. Multi subtractor. c. Half subtractor. d. Single subtractor.	CO2	1
10	Which of the following gates is described by the expression ? Select one: a. NAND Correct b. NOR c. OR d. AND	CO2	1

Unit III & IV

Sr. No.	Question	CO No.	Mark
1	A bidirectional 4-bit shift register is storing the nibble 1110. Its RIGHT/LEFT input is LOW. The nibble 0111 is waiting to be entered on the serial data input line. After two clock pulses the shift register is restoring A. 1110 B. 0111 C. 1000 D. 1001	CO3	1
2	A type of shift register that requires access to the Q output of all stages is-- A. Parallel in/Serial out B. Serial in/Parallel out C. Serial in/Serial out D. A bidirectional shift register		1
3	Asynchronous counters are often called --- counters. A. Toggle B. Ripple C. Binary D. Flip-Flop		1
4	How can parallel data be taken out of a shift register simultaneously? A. Use the Q output of the First FF B. Use the Q output of the last FF C. Tie all of the Q outputs together D. Use the Q output of each FF.		1
5	How many clock pulses will be required to completely load serially 5-bit shift register? A. 2 B. 3 C. 4 D. 5		1
6	How many Flip-flops are required to construct a decade counter? A. 10 B. 8 C. 5 D. 4		1
7	On the fifth clock pulse, a 4-bit Johnson sequesnce is Q0=0, Q1=1,Q2=1 and Q3=1. On the sixth clock pulse, the sequence is--- A. Q0=1 Q1=0 Q2=0 Q3=0 B. Q0=1 Q1=1 Q2=1 Q3=0 C. Q0=0 Q1=0 Q2=1 Q3=1 D. Q0=0 Q1=0 Q2=0 Q3=1		1

8	Register is--- A. Set of capacitorr used to register input instructions in a digital computer B. Set to paper tapes C. Temporary storage Unit within CPU D. Part of main Memory		1
9	Shift-register counters use ---- which means that the output of the last FF in the register is connected back to the first FF A. MOD B. Feedback C. Strobbing D. Switchback		1
10	The ---action of the flip flop is also called resetting A. Breaking B. Clearing C. Freeing D. Changing		1
11	The asynchronous inputes are normally labeled _____ and _____ and are normally active ___ inputs A. PRE,CLR,LOW B. ON,OFF,HIGH C. START,STOP,LOW D. SET,RESET,HIGH		1
12	The decimal equivalent of the largest number that can be stored in a 4-bit binary counter is --- A. 8 B. 15 C. 16 D. 32		1
13	The gated SR FF goes into the CLEAR condition when-- A. S is HIGH, R is LOW, EN is HIGH B. S is LOW, R is HIGH, EN is HIGH C. S is LOW, R is HIGH, EN is LOW D. S is HIGH, R is LOW, EN is LOW		1
14	The MOD-10 counter is also referred to as a ---counter. A. decade B. strobbing C. BCD D. Circuit		1
15	The terminal count of a modulus-11 binary counter is _____. A. 1010 B. 1000 C. 1011 D. 1100		1
16	What is the difference between a shift-right register and a shift-left register?		1

	A. There is no difference B. The direction of the shift C. Both A and B D. None of the Above		
17	When both inputs of a J-K FF are high the out is A. Be invalid B. Not change C. Reamin Unchanged D. Toggle		1
18	When the output of the NOR gate of S-R flip flop is Q=0,The inputs are A. S=1,R=1 B. S=1,R=0 C. S=0,R=1 D. S=0,R=0		1
19	Which is not characteristic of a shift register? A. Serial in-Serial Out B. Serial in-Parallel out C. Parallel in-parallel out D. Serial in-Parrallel in		1
20	Which of the following is correct for a D latch A. The output toggles if one of the inputs is held HIGH. B. Q output follows the input D when enable is HIGH C. Only one of the inputs can be HIGH at a time D. The output complement follows the input when enabled.		1



214444 Fundamentals of Data Structures

SYLLABUS

Teaching Scheme:
Lectures: 4 Hours/Week

Credits Examination Scheme:
04 In-Semester (Online): 50 Marks
End-Semester: 50 Marks

UNIT – IC Basics 6 Hours

Control structures, arrays, functions and parameter passing Structure and Union, String manipulation, matrix operations.

UNIT – II Pointers In C And File Handling 9 Hours

Introduction to Pointers, dynamic memory allocation, pointer to pointer, pointer to single and multidimensional arrays, array of pointers, string and structure manipulation using pointers, pointer to functions.
Pointer to file structure and basic operations on file, file handling in C.

UNIT – III Introduction To Data Structures And Analysis Of Algorithms 5 Hours

Introduction to Data Structures: Concept of data, Data object, Data structure, Abstract Data Types, realization of ADT in 'C'. Concept of Primitive and non-primitive, linear and Non-linear, static and dynamic, persistent and ephemeral data structures.
Analysis of algorithm: frequency count and its importance in analysis of an algorithm, Time complexity & Space complexity of an algorithm, Big 'O', 'Ω' and 'Θ' notations, Best, Worst and Average case analysis of an algorithm.

UNIT – IV Searching And Sorting Tehniques 7 Hours

Need of searching and sorting, Concept of internal and external sorting, sort stability. Searching methods: Linear and binary search algorithms their comparison and complexity analysis
Sorting methods: Bubble, selection, insertion, merge, quick, bucket sort and their time and space complexity analysis

UNIT – V Linear Data Structures Using Sequential Organization 8 Hours

Concept of sequential organization, Concept of Linear data structures, Concept of ordered list, Multidimensional arrays and their storage representation: row major and column major form and address calculation. Representation of sparse matrix using arrays, algorithms for sparse matrix addition, simple and fast transpose, polynomial representation using arrays. Analysis of these algorithms. Introduction to Stack and Queue, and their implementation using sequential organization, use of stack in recursion.

UNIT - VI Linear Data Structures Using Linked Organization 8 Hours

Concept of linked organization, singly linked list, doubly linked list, circular linked list. Linked list as an ADT. Representation and manipulations of polynomials use linked lists, comparisonof

a sequential and linked memory organization, concept of Generalized Linked List, representation polynomial using GLL.

a) Text Books

T1. R. Gilberg, B. Forouzan, "Data Structures: A pseudo code approach with C", Cenage Learning, SBN 9788131503140.

T2. G. A.V, PAI , "Data structures and Algorithms ", Mc Graw Hill, ISBN -13: 978-0-07-066726-6

T3. YashwantKanetkar, "Let us C", BPB Publication

T4. YashwantKanetkar , "Pointers in C" , BPB Publication

b) Reference Books

R1. R S Bichkar, "Programming with C", University Press, ISBN 978-81-7371-771-0

R2. Dennis Ritchie, Kernighan, "The C Programming Language", Prentice Hall

R3. Treamblay, Sorenson,"An introduction to data structures with applications",Tata McGraw Hill, Second Edition

R4. Seymour Lipschutz, "Data structures with C", Schaum's Publication

R5. E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of Data Structures in C", Universities Press, 2008 ,

R6. Aaron Tanenbaum, "Data Structures using C", Pearson Education

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit	Assessment Technique	Blooms Taxonomy Category
C214444.1	Apply appropriate constructs of C language, coding standards for application development.	I	Mock MCQ Test	Apply
C214444.2	Make Use of dynamic memory allocation concepts and file handling in various application developments.	II, VI	Mock MCQ Test	Apply
C214444.3	Classify basic analysis of algorithms with respect to time and space complexity.	III	Mock MCQ Test	Classify
C214444.4	Select appropriate searching and/or sorting techniques in the application development	IV	Mock MCQ Test	Apply
C214444.5	Select and use appropriate data structures for problem solving and programming.	V, VI	Mock End Term TheoryTest	Apply

PREREQUISITES

Sr. No.	Unit Number	Prerequisite subject name
1.	I	FPL I
2.	II	
3.	III	
4.	IV	
5.	V	
6.	VI	

TEACHING PLAN

Teaching Plan Short

Academic Year:- 2019-20 Semester :- I w. e. f. :- 15/06/2019

Class : - SE Division: A/B

Subject :- FDS Subject Code :- 214444

Faculty In charge :- Mrs. Supriya Jagtap / Mrs. Mukta Jamage No. of Lectures/ weeks: 4

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start week	End week
1.	I	Basics of C	8	June Week3
2.	II	Pointers in C	8	July Week1
3.	III	Introduction to Data Structures and Analysis of Algorithms	6	July Week3
4.	IV	Searching and Sorting Techniques	9	August Week1
5.	VI	Linear Data Structures using Linked Organization	6	August Week4
6.	V	Linear Data Structures using Sequential Organization	8	September Week2

Detail Teaching Plan

Lect. No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO to Attain	Measurable to attain CO	Mode of Delivery
1	I	Control structures		Lesson 2, YashwantKanetkar, "Let us C", BPB Publication	C214444.1	MCQ Test	Chalk and Talk , Machine Projector for Demo of Implementation, Video
2		Arrays		Lesson 8, YashwantKanetkar, "Let us C", BPB Publication			
3		2D Arrays and nD Array	Matrix operations				
4		Functions	Pass by Value	Lesson 5, YashwantKanetkar, "Let us C", BPB Publication			
5			Pass by reference	Lesson 5, YashwantKanetkar, "Let us C", BPB Publication			
6		String manipulation		Lesson 9, YashwantKanetkar, "Let us C", BPB Publication			
7		Structure		Lesson 10, YashwantKanetkar, "Let us C", BPB Publication			
8		Structure , union					

9	II	Introduction to Pointers	Dynamic Memory allocation, pointer to pointer, Array of Pointers	Lesson 5, YashwantKanetkar, "Let us C", BPB Publication	C214444.2	MCQ Test	Chalk and Talk, Machine Projector of Demo Implementation, Video
10		Pointer to arrays	Pointer to single dimensional arrays.	Lesson 8, YashwantKanetkar, "Let us C", BPB Publication			
11			Pointer to Multidimensional Arrays	Lesson 8, YashwantKanetkar, "Let us C", BPB Publication			
12		String manipulation using pointers		Lesson 8, YashwantKanetkar, "Let us C", BPB Publication	C214444.2	MCQ Test	
13		structure manipulation using pointers		Lesson 10, YashwantKanetkar, "Let us C", BPB Publication			
14		Pointer to functions		Lesson 5, YashwantKanetkar, "Let us C", BPB Publication			
15		Pointer to file structure and basic operations on file		Lesson 12, YashwantKanetkar, "Let us C", BPB Publication			

16		Functions used for text and binary file handling in C		Lesson 12, YashwantKanetkar, “Let us C”, BPB Publication			
17	III	Introduction to Data Structures Abstract Data Types, Realization of ADT in 'C'.	Concept of data, Data object, Data structure,	Chapter 1, E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of Data Structures in C", Chapter 1, E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of Data Structures in C"	C214444.3	MCQ Test	Chalk and Talk
18		Concept of Classification of Data Structures	Primitive and non-primitive, linear and Non-linear, static and dynamic, persistent and ephemeral data structures				
19		Analysis of algorithm	Frequency count and its importance in analysis of an algorithm		C214444.3	MCQ Test	Chalk and Talk
20			Time complexity & Space complexity of an algorithm				

21			Big 'O', Omega and Theta notations				
22			Best, Worst and Average case analysis of an algorithm				
23	IV	Need of searching and sorting, Concept of internal and external sorting, sort stability		Chapter 7, E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of Data Structures in C"	C214444.4	MCQ Test	Chalk and Talk, Presentation, Video
24		**Searching methods:**	Linear search algorithms				
25			binary search and comparison with linear search and complexity analysis				
26		**Sorting methods:**	Bubble sort and time and space complexity analysis				Chalk and Talk, Presentation, Video
27			selection sort and time and space complexity	Chapter 1, E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of			

			analysis	Data Structures in C"			
28			Insertion sort and time and space complexity analysis	Chapter 7, E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of Data Structures in C"			
29			Merge sort and time and space complexity analysis		C214444.4	MCQ Test	Chalk and Talk, Presentation
30			Quick sort and time and space complexity analysis				
31			Bucket sort and their time and space complexity analysis				
32	VI	Concept of linked organization	singly linked list as an ADT	Chapter 4, E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of Data Structures in C"	C214444.2 and C214444.5	End Term Test	Chalk and Talk and Presentation
33			doubly linked list as an ADT				
34			circular linked list as an ADT				

35		Representation and manipulations of polynomials using linked lists,					
36		Comparison of a sequential and linked memory organization,					
37		Concept of Generalized Linked List, representation polynomial using GLL					
38	V	Concept of sequential organization, Concept of Linear data structures, Concept of ordered list		R5 Chapter 2	C214444.5	End Term Test	Chalk and Talk and Presentation
39		Multidimensional Arrays and their storage representation	Row major and column major form and address calculation.	Chapter 2, E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of Data Structures in C"			

40		Representation of sparse matrix using arrays	algorithms for sparse matrix addition and simple transpose and Analysis				Chalk and Talk, Presentation, Video
41			algorithms for sparse matrix fast transpose and Analysis				
42		Polynomial representation using arrays and Analysis					
43		Concept of stack and its implementation		Chapter 3, E. Horowitz, S. Sahani, S. Anderson-Freed "Fundamentals of Data Structures in C"			
44		Use of stack it in recursion,	Recursive algorithms e.g. Factorial, Fibonacci series, etc		C214444.5		
45		Concept of Queue and its implementation					

UNIT WISE QUESTION BANK

Unit I

Sr. No.	Question	CO No.	Marks	University Year
1	Explain the need of parameter passing in functions. Demonstrate different types of parameter passing in C with example for each.		**6**	May 2019
2	Explain difference between structure and union. Demonstrate each with example		**6**	
3	Explain how strings are represented in C. Write a pseudo code for checking whether given string is palindrome or not,	C214444.1	6	May 2018, May 2019
4.	Write a pseudo code to find out length of string without library function.		4	
5.	Write a difference between while and for loop in C language.		6	Dec 2017
6	What is recursion? Explain it with example.		4	
7.	Explain various operators in C.		4	
8.	Explain entry controlled loop structure in C		4	May 2017
9.	What are advantages of using structure? Give difference between Union and Structure.		4	
10.	Explain concept of arrays with suitable example.		4	
11	Illustrate difference between Union and Structure with suitable example.		4	Dec 2016
12	Explain if and switch case decision control statements		4	
13	Explain arrays with example		4	

Unit II

Sr. No.	Question	CO No.	Marks	University Year
1	Write pseudo code to store heights of N students dynamically and find average height[Use malloc()]	6		May 2019
2	Demonstrate how to access elements of an array using pointer notation. Write pseudo code to find out max	6		May 2019

	element in an array of size, using pointer notation			
3	Explain poinerveriable with example	C214444.2	2	May 2018

4	Given the following declarations:
	int m=50, n=50;
	int *p1 = &m, *p2 = &n;
	What is the value of each of following expression?
	i. (*p1)++;
	ii. - - (*p1);
	iii. *p1 + (*p2) - - ;
	iv. ++(*p2) - *p1;
			4	

5.	Explain how an array is passed to the function as a pointer with example.		4	
6	Explain any four file operations.		4	
7.	Differentiate between Text and Binary files.		4	
8	Explain call by value and call by reference with suitable example.	C214444.2	6	Dec 2017
9.	What is pointer variable? Explain declaration. Initialization and accessing a pointer variable with example.		4	May 2017
10	Write pseudo C Algorithm for reverse of string using pointers.		4	
11	Explain call by value and call by reference with suitable example.		4	
12	Write a C program to swap two numbers using call by reference.		4	Dec 2016
13	What is pointer variable? Explain declaration. Initialization and accessing a pointer variable with example		6	

Unit III

Sr. No.	Question	CO No.	Marks	University Year
1	Discuss in detail the different asymptotic notations used to represent time complexity of an algorithm.		6	May 2019
2	What is time complexity of an algorithm? Explain its importance with suitable example.		3	May 2018
3	Explain linear and non-linear data structure with suitable examples	C214444.3	3	
4	W.r.t. the Algorithm analysis, explain following terms: i. Big Oh notation ii. Omega notation		6	

5	Define: i. Data and data object ii. Abstract Data Types		6	Dec 2017
6	Differentiate between the following: i. Primitive and non-primitive data structures. ii. Linear and non-linear data structures		6	
7	Define: i. Data and data object ii. Data Structure iii. Abstract Data Types		6	May 2017
8.	W.r.t. the Algorithm analysis, explain following terms: i. Big Oh notation ii. Theta notation.		6	
9	Define: i. Data and data object ii. Data Structure		6	Dec 2016
10	Differentiate between the following: i. Primitive and non-primitive data structures. ii. Linear and non-linear data structures iii. Static and Dynamic Data Structures		6	

Unit IV

Sr. No.	Question	CO No.	Marks	University Year
1	With example discuss the criteria for choosing a sorting algorithm based on the input size and time complexity [Bubble, Insertion, Quick]		6	May 2019
2	For the following set of numbers, perform stepwise demonstration of merge sort algorithm : 91 23 48 13 97 63 27 36 57		6	May 2019
3	Show the output of each pass using insertion sort to arrange the following numbers in ascending order. 150 350 100 250 200 50 300		6	May 2018
4	Explain the importance of searching and sorting in computer science field. What is sort stability?		4	
5	What is importance of pivot element in quick sort?	C214444.4	2	
6	Write an algorithm to sort a list of integers using bubble sort. Show output of each pass for the following lsit : 10 5 4 18 17 1 2.		6	Dec 2017
7	Differentiate between the following: i. Internal sorting and External sorting		6	

	ii. Linear and binary searching			
8	Write pseudo C Algorithm for i. Linear Search ii. Binary Search		7	May 2017
9	Explain the selection sort with given example by showing all passes. Also analyze the time complexity. Numbers are : 17 35 24 13 26 14		7	
10	Sort the following and show the status of every pass using Selection sort: 34 9 78 65 12 -5		6	Dec 2016
11	Sort following data to ascending order using Quick sort. Show all passes with pivot. 17 8 -9 2 0 -5 7 20 11 15		6	

Unit V

Sr. No.	Question	CO No.	Marks	University Year
1	Describe significance of sparse matrix. With example demonstrate the steps of sparse matrix addition.		8	May 2019
2	Explain representation of polynomial node using array and using structure.		8	May 2019
3	Explain the following Linear Data Structures 1. Stack 2. Queue		8	May 2019
4	Represent the following polynomials using array: 1. $3x^{14} + 2x^{-8} + 1$ 2. $15x^3y^2 - 10x^2 + 7y - 10$		8	May 2019
5	What is sparse matrix? What are its applications?	C214444.5	5	May 2018
6	Explain row major and column major representation of arrays.		4	
7	Represent the following polynomials using arrays: i. 5x^2 – 10xy +y^2 -20 ii. X^4 + 59x + 10		4	
8	What is sequential memory organization? List advantages and dis-advantages of sequential memory organization.		5	
9	Write a pseudo code for following stack operations : i. Push on Stack ii. Pop from Stack		4	

10.	Explain the address calculation of elements in arrays in row major and column major representation.		4	
11.	Explain and simple and fast transpose of a sparse matrix with example. Also write fast transpose C Function for Sparse Matrix.		8	
12.	Explain the concept of row major and column major representation of a matrix with example.		6	Dec 2017
13.	Represent the following polynomials using arrays: i. X^2 + 13xy^4 + 2x^3y^3 + 15y ii. 3x^3 + 2y^2x + 5y^3x^3 + 17		8	
14	Write pseudo algorithm for Addition of two sparse matrices. Analyze its time complexity.		6	
15	Explain 2D array in detail with row and column major representation and address calculation in both the cases.		6	May 2017
16	Explain stack with C pseudo code for PUSH and POP operations.		6	
17	Explain polynomial representation using array and also write data structure declaration with suitable example.		6	
18	Define Polynomial. Representation following using arrays. i. x^3 + x^2 + x + 16 ii. x^5y^4 + x^3y^3 + x^2 + y^2 + 10		7	
19	Explain simple and Fast transpose with suitable example		6	Dec 2016
20	Explain sequential memory organization with example		6	
21	Explain 2D array in detail with row and column major representation and address calculation in both the cases.		7	

Unit VI

Sr. No.	Question	CO No.	Marks	University Year
1	What is ADT? Explain singly linked list as ADT.		6	May 2019
2	Explain with example.Doubly Linked List 1. Circular Linked List		6	May 2019
3	Write C function for inserting and deleting a node of SLL		**6**	May 2019
4.	Represent the following list using GLL		**6**	May 2019

	(a, (b, c), (d, (e, f, g)), h)			
5	Compare linked list with arrays with reference to the following aspects: i. Accessing any element randomly. ii. Insertion and deletion of an element. iii. Utilization of memory.		6	
6	Write a pseudo code to delete a node from SLL.		7	May 2018
7	Explain GLL. Represent following polynomial using GLL. (p, q, (r, s, (t, u, v), w), x, u).		6	
8	Write a pseudo code to insert a node at start and at end in DLL.		7	
9	Write short notes on i. CLL ii. DLL iii. SLL iv. Skip List		8	
10	Write a 'C' function to reverse a singly linked list using three pointers.	C214444.1 and C214444.5	4	Dec 2017
11	What is GLL? Represent following lists : i. (a, b, c, (d, e, f), g, h) ii. (p, (q,r), s, (t, u), v)		8	
12	Differentiate between sequential and linked organization		4	
13	Explain concept of GLL and generate GLL for (a, b, c, (d, (e, f), g, h), i, (j), k)		6	
14	Write C function to insert a node and delete a node in DLL.		7	
15	Explain with suitable example: i. CLL ii. Linked list as an ADT.		6	May 2017
16	Write C pseudo algorithm for merging of two sorted Linked lists into the third one.		7	
17	What are advantages of Linked list over array. Describe different types of linked lists.		7	
18	Write C functions to perform following operations on SLL: i. Insert element at any position ii. Reverse the string without use of any other DS		6	
19	Write a function to delete any node from DLL		6	Dec 2016
20	Explain the concept of GLL and represent the following GLL i. ((a, b),(c, d), e) ii. (a, (b, c), d)		7	

HOME AGSSIGNMENTS

Unit I

1. How would you compare macro with functions and discuss ways of parameter passing in C function.
2. What approach would you use to choose pointer to function
3. How would you use the controlled loop structure in C
4. Explain the importance/advantages of- Macro, Structure, Arrays, union
5. How would you explain importance of Dynamic memory allocation.
   Explain memory allocation, access, initialization of structure variable with suitable example.

Unit-II

1. How would you explain the importance of pointer?
2. How 2D array can be handle using pointers
3. Which parameter will you choose to explain call by value fun and call by refrence functions.
4. Discuss the file handling function and its modes
5. What approachwould you use to choose sequential file over unordered file

Unit III

1. Differentiate primitive and nonprimitive data structures with example
2. Differentiate & Non linear data structures with example also state need of data structures?
3. Calculate complexity of algorithm to calculate area of circle
4. What evidence can you find to state the importance of frequence count function in analysis of algorithnm
5. What conclusion will you draw from space complexity of algorithm based on parameter used.

Unit IV

1. With example discuss the criteria for choosing a sorting algorithm based on the input size and time complexity [Bubble, Insertion, Quick]
2. Write an algorithm to sort a list of integers using bubble sort. Show output of each pass for the following list: 10 5 4 18 17 1 2.
3. Explain the selection sort with given example by showing all passes. Also analyze the time complexity. Numbers are : 17 35 24 13 26 14

4. Sort following data to ascending order using Quick sort. Show all passes with pivot.
5. 17 8 -9 2 0 -5 7 20 11 15
6. Show the output of each pass using insertion sort to arrange the following numbers in ascending order.
7. 150 350 100 250 200 50 300

Unit V

1. Write a pseudo code for following stack operations :
   i. Push on Stack
   ii. Pop from Stack
2. Represent the following polynomials using arrays:
   i) X^2 + 13xy^4 + 2x^3y^3 + 15y
   ii) 3x^3 + 2y^2x + 5y^3x^3 + 17
3. Describe significance of sparse matrix. With example demonstrate the steps of sparse matrix addition.
4. Explain the address calculation of elements in arrays in row major and column major representation.
5. What is sequential memory organization? List advantages and dis-advantages of sequential memory organization.

Unit VI

1. Write a 'C' function to reverse a singly linked list using three pointers.
2. Write a pseudo code to insert a node at start and at end in DLL.
3. Write a function to delete any node from CLL
4. Write C functions to perform following operations on SLL:
   i) Insert element at any position
   ii) Reverse the string without use of any other DS
6. Explain GLL. Represent following polynomial using GLL.
   (p, q, (r, s, (t, u, v), w), x, u).

QUESTION BANK (MCQ)

Unit I

Sr. No.	Question	CO	Marks
1	A function which invokes itself repeatedly until some condition is satisfied is called a _____ function. **a.** Recursive **b.** System **c.** Library **d.** None of these	C214444.1	1
2	++ is _____ operator: a. Decrement b. Increment c. Add d. Plus-Plus	C214444.1	1
3	Which is the incorrect statement: a. An array is the collection of variables. b. All array variables have same type. c. Array variables can be used individually. d. None of these.	C214444.1	1
4	An array can be declared: a. Statically b. Dynamically c. Both d. None of these	C214444.1	1
5	Array can be: a. Single Dimensional b. Multi Dimensional c. Both d. None of these	C214444.1	1
6	Array index is always starts from: a. 0 b. 1 c. 2 d. 3	C214444.1	1
7	An array is _____ data-structure: a. Linear b. Non-linear c. Hierarchical	C214444.1	1

	d. None of these		
8	Which is the false statement: a. An array of characters is called string. b. Array can be passed to function. c. Array is always reference type. d. None of these	C214444.1	1
9	Array can be sorted by using: a. Bubble Sort b. Merge Sort c. Quick Sort d. All of above	C214444.1	1

10	Which is not the output function:
	a.printf();
	b.puts();
	c.puchar();
	d.putch();
	e.None of these.
		C214444.1	1

Unit II

Sr. No.	Question	CO	Marks
1	A pointer variable can store _____ 2. a. Constant value 3. b. Value of anther variable. 4. c. Address of another variable 5. d. None of these.	C214444.2	1
2	int *ptr; here ptr can store the address of: 6. a. int variable 7. b. float variable 8. c. double variable 9. d. All of above	C214444.2	2
3	int x=10; int *y=&x; the variable y contains: a.Value of x; b.Address of x; c.Both d.None of these	C214444.2	1
4	int **ptr; here ptr is: 10. a.Pointer 11. b.Pointer to pointer 12. c.Both	C214444.2	1

	13. d.None of these		
5	In the call by reference we pass: 14. a.Value of the variable 15. b.Address of variable 16. c.Both value and address 17. d.None of these	C214444.2	1
6	int a[3]={4,5,6}; printf("%u",a); What is the output: a. Value of first element. b. Address of first element c. Both d. None of these	C214444.2	1
7	Which function is related to dynamic memory allocation: a. malloc(); b. calloc() c. realloc() d. All of above.	C214444.2	1

8	Which is the incorrect function prototype based on c library:
	a. char *gets(char *string);
	b. int puts(const char*s);
	c. char *cgets(char *str);
	d. intcputs(const char*str);
	e. None of these
		C214444.2	1

9	What will be output?
	#include <stdio.h>
	main()
	{
	char *p = 0;
	*p = 'a';
	printf("value in pointer p is %c\n", *p);
	}
	
	a. It will print a
	b. It will print 0
	c. Compile time error
	d. Run time error
		C214444.2	1

10	char *name= "India"; strupr(name); puts(name); Output of this program is: a. India	C214444.2	1

	b. india c. INDIA d. iNDIA		

Unit III

Sr. No.	Question	CO	Marks
1	An efficient algorithm _____ a. Takes efficient time b. Takes efficient memory c. Both d. None of these	C214444.3	1

2	What will be the output of following program:
	#include <stdio.h>
	int main()
	{
	inti,j;
	for(i=1;i<=5;++i)
	{
	for(j=1;j<=i;++j)
	{
	printf("%d ",j);
	}
	printf("\n");
	}
	return 0;
	}
	a. 1 2 3 4 5
	1 2 3 4 5
	1 2 3 4 5
	1 2 3 4 5
	1 2 3 4 5
	b. 1
	1 2
	1 2 3
	1 2 3 4
	c. 1 2 3 4 5
	1 2 3 4 5
	1 2 3 4
		C214444.3	1

	1 2 3 1 2 1 d. none of the above		

3	Calculate time complexity required for following code:
	for(i=0;i<n;i++)
	for(j=0;j<n-1;j++)
	for(k=0;k<n-2;k++)
	if(a[j]<a[k])
	printf("\n DONE…..");
	a. O(n)
	b. $O(n^2)$
	c. $O(n^3)$
	d. O(n+n(n-1)+n(n-1)(n-2))
		C214444.3	1

4	Calculate the address of element A[5][4] if the array is declared as float A[6][6] and its base address is 45610. **a.** 45644 **b.** 45746 **c.** 45639 d. 45726	C214444.3	2
5	An array is _____ data-structure: a. Linear b. Non-linear c. Hierarchical d. None of these	C214444.3	1
6	Structured programming have: a. Sequence b. Selection c. Iteration d. All of Above	C214444.3	1
7	Stack is a. Ephemeral DS b. Persistent DS c. Primary DS d.Non of the above	C214444.3	1

Unit IV

Sr. No.	Question	CO	Marks

1	Complete following steps which are required for sorting given 5 numbers in ascending order:
	for(i=0;i<5;i++)
	for(j=0;j<4;j++)
	{
	if(----------)
	{
	temp=a[j];
	a[j]=a[j+1];
	a[j+1]=temp;
	}
	}
	a. a[j]>a[j+1]
	b. a[j]<a[j+1]
	c. a[i]>a[j]
	d. a[i]>a[i+1]
		C214444.4	1

2	Complete following steps which are required for sorting given 5 numbers in descending order:
	for(i=0;i<5;i++)
	for(j=0;j<4;j++)
	{
	if(----------)
	{
	temp=a[j];
	a[j]=a[j+1];
	a[j+1]=temp;
	}
	}
	e. a[j]>a[j+1]
	f. a[j]<a[j+1]
	g. a[i]>a[j]
	h. a[i]>a[i+1]
		C214444.4	1

3	For 5 numbers, find out the time complexity for bubble sort for worst case.	C214444.4	1

	a. 5 b. 10 c. 20 d. 25		
4	Complete following given passes required for merge sort. pass #1- 55 11 77 22 99 66 pass #2- _____ pass #3- _____ pass #4- 11 22 55 66 77 99 a. pass #2- 55 11 22 66 77 99 pass #3- 11 22 66 55 77 99 b. pass #2- 11 55 22 77 66 99 pass #3- 11 22 55 77 66 99 c. pass #2- 11 55 22 77 66 99 pass #3- 11 55 22 77 66 99 d. pass #2- 11 55 22 77 66 99 pass #3- 11 22 55 66 77 99	C214444.4	2
5	Array can be sorted by using: a. Bubble Sort b. Merge Sort c. Quick Sort d. All of above	C214444.3	1

ADDITIONAL RESOURCES

1. Youtube Channel “Tech Talks”
2. NPTL Course- Programming In C

214445

Problem Solving and Object Oriented programming

SYLLABUS

Teaching Scheme: **Credits Examination Scheme:**

Lectures: 4 Hours/Week 04In-Semester (Online): 50 Marks
End-Semester: 50 Marks

UNIT – I Problem Solving Concepts **6 Hours**

General Problem Solving Concepts-Types of problems, problems solving with computers, difficulties with problem solving, Problem Solving Aspects, Problem Solving Concepts for computer- constants and variables, data types, functions, operators, expressions and equations, Programming Concepts – communicating with computers, organizing the problem, using the tools, testing the solution, coding the program, Top down design

UNIT – II Problem Solving with Logic Structures **6 Hours**

Programming Structure - modules and their functions, cohesion & Coupling, Local and global variable, parameters, return values, variable names and data dictionaries, four logic structures. Problem solving with sequential logic structure - The sequential logic structure, solution development. Problem Solving with Decisions – decision logic structure, multiple if/then/else instructions, straight-through logic, positive logic, negative logic, logic conversion, decision tables. Problem solving with loops and case logic structures

UNIT – III Foundations of Object Oriented Programming **6 Hours**

Introduction: Introduction to procedural, modular, object-oriented and generic programming techniques, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming: objects, classes, data members, methods, messages, data encapsulation, data abstraction and information hiding, inheritance, polymorphism

++ Extensions to C : Variable declarations, global scope, 'const', reference variables, operators in C++(scope resolution, new , delete), dynamic memory allocation, function prototypes, default and constant arguments, 'cin', 'cout', inline functions

Class: Defining a class, data members and member functions, public, private and protected members, inline member functions, static data members, static member functions, constructors, destructors, array of objects, classes, objects and memory, class as ADTs and code reuse

UNIT – IV Overloading and Inheritance **8 Hours**

Function overloading, friend function, friend class

Operator Overloading : Introduction, Need of operator overloading, rules for operator overloading, overloading the unary and binary operators using member function, operator overloading using friend function, overloading relational and logical operators, overloading new, delete and assignment operator, type conversions

Inheritance : Introduction, Need of inheritance, base and derived classes, member access

control, types of inheritance, derived class constructor, constructors in multiple inheritance, overriding member functions, ambiguity in multiple inheritance, virtual base class

UNIT – V Virtual Functions and Templates 7 Hours

Virtual functions : Pointers to objects, 'this' pointer, Pointers to derived class, virtual function, rules for virtual function, pure virtual function, abstract class, virtual destructors, early and late binding, container classes

Templates : Introduction, Function template and class template, overloading function template, member function templates and template arguments, Introduction to Standard Template Library (STL), containers, iterators and algorithms

UNIT - VI Exception Handling and File I/O 7 Hours

Namespaces: Introduction, Rules of namespaces

Exception Handling: Introduction, Exception handling mechanism: try, catch and throw, Multiple Exceptions, Exceptions with arguments

Managing Console I/O Operations: Introduction, C++ streams, stream classes, unformatted I/O, formatted I/O and I/O manipulators

File I/O: Introduction, Classes for file stream operations, file operations (open, close, read, write, detect end of file), file modes, File pointers and their manipulations, error handling during file operations

Text Books

1. R G Dromey, "How to Solve it by Computer", Pearson Education, 2008, ISBN-13: 978-8131705629.

2. Maureen Spankle, "Problem Solving and Programming Concepts", Pearson, 2011, ISBN-13: 978-0132492645.

3. Robert Lafore, "Object-Oriented Programming in C++", SAMS Techmedia.

Reference Books

1.Joyce Farrell, "Programming Logic and Design", Cengage Learning, ISBN-13: 978-1285776712.

2.E. Balaguruswamy, "Object-oriented Programming with C++", Tata McGraw Hill, 5 th edition.

3.HerbertSchildt, "C++: The Complete Reference", McGraw-Hill.

4.Shukla, "Object-Oriented Programming in C++, w/cd", Wiley, ISBN-9788126516582.

5.Kogent, "Object Oriented Programming Methodology", Wiley, ISBN-9789351191841.

6.Venugopal, "Mastering C++", McGraw-Hill, ISBN-9781259029943.

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit	Assessment Technique	Blooms Taxonomy Category
C214445.1	To construct algorithm to solve problems on Modular Programming.	I	OnlineMCQ Exam	Create
C214445.2	To make use logic structures for programming problem solving.	II	Online MCQ Exam	Evaluate
C214445.3	To understand OOP concepts through Abstract Data and Entities.	III	Online MCQ Exam	Understand
C214445.4	To analyze and implement real life problems by OOP.	IV,V,VI	Online MCQ Exam, Theory Unit Test	Analyze

PREREQUISITES

Sr. No.	Unit Number	Prerequisite subject name
1.	I	Principles of problem solving concepts in programming
2.	II	Principles of problem solving concepts in programming
3.	III	Principles of Programming Languages
4.	IV	Principles of Programming Languages
5.	V	Principles of Programming Languages
6.	VI	Principles of Programming Languages

TEACHING PLAN

Teaching Plan Short

Academic Year:-2019-20 Semester :- I w. e. f. :-15/6/2019

Class : - SE Division:A&B

Subject :- PSOOP Subject Code :-214445

Faculty In charge :- Ashwini Bhamare. And RajshriSadafule No. of Lectures/ weeks: 4

- **Lecture Plan**

Sr. No.	Unit No.	Unit/ Topic Name	Start Date	End Date
1.	III	Foundations of Object Oriented Programming	18-06-2019	06-7-2019
2.	IV	Overloading and Inheritance	09-07-2019	25-07-2019
3.	I	Problem Solving Concepts	26-07-2019	08-8-2019
4.	II	Problem Solving with Logic Structures	09-08-2019	17-08-2019
5.	V	Virtual Functions and Templates	20-08-2019	06-09-2019
6.	VI	Exception Handling and File I/O	07-09-2019	22-09-2019

Detail Teaching Plan

Lect. No	Unit No.	Main Topic to be Covered	Sub Topics to be Covered	Chap. No. & Reference Books	CO Attainment	Measurable to Attained COs	Mode of Delivery
1	**I**	**Problem Solving Concepts**	General Problem Solving Concepts-Types of problems.	Problem Solving and concepts"MaureenSpankle"	C214445.1	Online MCQ Exam, Assignment	Chalk and Talk
2			Problems solving with computers,difficulties with problem solving, Problem Solving Aspects	Problem Solving and concepts"MaureenSpankle"			
3			Problem Solving Concepts forcomputer-constants and variables, data types, functions, operators, expressions and equations	Problem Solving and concepts"MaureenSpankle"			
4		**Programming Concepts**	Programming Concepts – communicating with computers, organizing the problem,	Problem Solving and concepts"MaureenSpankle"			Chalk and Talk, ppt
5			Using thetools, Testing	Problem Solving and			

			the solution,	concepts"MaureenSpankle"			
6			coding the program, Top down design				
7	**II**	**Problem solving with logic Structures**	**Programming Structure** - modules and their functions, cohesion & Coupling, Local and globalvariable	Problem Solving and concepts"MaureenSpankle"	C214445.1,C214445.2	Online MCQ Exam, Assignment	Chalk and Talk, PPT
8			Programming Structureparameters, return values, variable names and data dictionaries, four logic structures.	Problem Solving and concepts"MaureenSpankle"			
9			Problem solving with sequential logic structure - The sequential logic structure, solution Development.	Problem Solving and concepts"MaureenSpankle"			
10			Problem Solving with Decisions – decision logic structure	Problem Solving and concepts"MaureenSpankle"			

11			multiple if/then/else instructions, straight-through logic, positive logic, negative logic	Problem Solving and concepts"MaureenSpankle"			
12			logic conversion, decision Tables. Problem solving with loops and case logic structures	Problem Solving and concepts"MaureenSpankle"			
13	Test						
14	**III**	**Foundations of Object Oriented Programming**	Introduction to procedural, modular, object-oriented and generic programming Techniques, Limitations of procedural programming, Need of object-oriented programming, fundamentals of object-oriented programming	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.	C214445.3	Online MCQ Exam, Lab Test	Chalk and Talk
15			objects, classes, data members, methods, Messages, data	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			

			encapsulation, data abstraction and information hiding, inheritance, Polymorphism				
16		**Extensions to C**	Extensions to C	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
17		**Class**:	Defining a class, data members and methods, public, private and protected members,	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
18			inline member functions, static data members, static member functions, 'this' pointer	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.	C214445.3	Online MCQ Exam, Lab Test	
19			Constructors, destructors, friend function, dynamic memory allocation	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
20			Array of objects, pointers and classes, class as ADTs and code reuse	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			

21			Assessment of Unit III				
22	**IV**	**Overloading and Inheritance**	Function overloading, friend function, friend class	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.	C214445.3	Online MCQ Exam, Lab Test	Chalk and Talk, PPT
23		**Operator Overloading**	Introduction, Need of operator overloading, rules for operator overloading	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
24			overloading the unary and binary operators using member function	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
25		**Inheritance**	operator overloading using friend function, overloading relational and logical operators	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
26			overloading new, delete and assignmentoperator, type conversions	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
27			Introduction, Need of inheritance, base and derived classes, member access control	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
28			types of inheritance, derived class	Herbert Schildt, "C++: The Complete Reference",			

			constructor,constructors in multiple inheritance	McGraw-Hill.			
29			Overridingmember functions, ambiguity in multiple inheritance, virtual base class	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
30			Assessment of Unit IV				
31	**V**	**Virtual Functions and Templates**	Virtual functions : Pointers to objects, 'this' pointer, Pointers to derived class	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.	C214445.3	Written test, Lab Test	
32			virtual function, rules forvirtual function, pure virtual function	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
33			abstract class, virtual destructors, early and late binding	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
34	Test						
35		**Templates**	container classes, Introduction, Function template	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
36			class template	Herbert Schildt, "C++: The			

			,overloading function template	Complete Reference", McGraw-Hill.			
37			member function templates and template arguments, Introduction to Standard	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
38			Template Library (STL), containers, iterators and algorithms	T3,R4HerbertSchildt, "C++: The Complete Reference", McGraw-Hill.			Chalk and Talk
39	**VI**	**Exception Handling and File I/O**	Namespaces: Introduction, Rules of namespaces Exception Handling: Introduction	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.		Written test, Lab Test	Chalk and Talk
40			Exception handling mechanism: try, catch and throw, Multiple Exceptions, Exceptions with arguments	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
41			Managing Console I/O Operations: Introduction, C++ streams, stream classes	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.	C214445.3		

42			unformatted I/O, formatted I/O and I/O manipulators	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			Chalk and Talk, PPT
43		**File I/O**	Introduction, Classes for file stream operations, file operations (open, close, read, write, detect end of file)	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
44			file operations ,file modes, File pointers and their manipulations	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
45			error handling during file operations	Herbert Schildt, "C++: The Complete Reference", McGraw-Hill.			
46	Assessment of Unit V,VI						

Unit wise Question Bank

Unit I Question Bank

Sr. No.	Question	CO No.	Marks	University Year
1	Q1.Explain the different steps of problem solving.	CO1	4	Dec 09 May 14
2	Q2.What are the rules for naming variable?		4	May 11
3	Q3.Explain different types of operator with suitable example.		6	May 16
4	Q4.Explain different organizing tools with suitable example.		8	
5	Q5.What is PAC chart? Explain with suitable example.		6	May 11
6	Q6.Explain structure chart.		4	
7	Q7.What is IPO Chart? Explain the structure of IPO chart.		4	Dec 09
8	Q8.Why testing solution is required?		4	
9	Q9.Write a short note on function.		6	May 10
10	Q10.Explain the different symbols for drawing the flowchart.		6	Dec 13
11	Q11.Explain the constant and variable.		4	
12	Q12.Explain the problems that can be solved with computer.		4	
13	Q13.Discuss difficulties associated with problem solving.		4	Dec 10
14	Q14.Explain the concept algorithm and flow chart.		6	
15	Q15.Why operators are used?		4	
16	Q16.Write short note on Top down Design.		6	May 16

Unit II Question Bank

Sr. No.	Question	CO No.	Marks	University Year
1	Q1.Explain the different types of module.	CO2	4	Dec 09
2	Q2. Write the short note on coupling diagram.		4	Dec 09
3	Q3. Explain decision logic structure briefly.		6	Dec13, may 16
4	Q4. Write note on data dictionary and explain with examples.		6	Dec 13
5	Q5. Explain the loop logic structure briefly.		8	Dec 15
6	Q6. Explain the case logic structure briefly.		6	
7	Q7. Write a note on a) Parameter		10	Dec 15

	b) Return value c) Local and global variable d) Sequential logic structure			
8	Q8. Explain the things required to develop efficient computer solution to the program.		6	
9	Q9. Explain the concept of cohesion and coupling with example.		4	
10	Q10. Explain difference between Positive logic and negative logic.		6	
11	Q11. State concept of logic conversion.		6	
12	Q12.Compare the call by value and call by reference.		4	May 14
13	Q13. What is procedure for developing the decision table.		4	
14	Q14. State rules that should be following while designing a module.		4	
15	Q15. Write short note on sequence logic structure.		6	

Unit III Question Bank

Sr. No.	Question	CO No.	Marks	University Year
1	Q1.Write benefits of OOP.	CO3	4	May 14
2	Q5.Explain Friend function using example		6	
3	Q6. Implement constructor and destructor		6	Dec 14, May 15
4	Q7.Write a program in C++ for creating array of student object (for 150 students). Create class student with data members as Roll Number, Name, Address, mobile number and member functions as get data and display data. Define member function outside class.[8]		8	Dec 14
5	Q8.Differentiate between Procedural Oriented Programming and Object-oriented Programming. [6]		6	Dec 14
6	Q9.Explain static member function		6	

7	Q10.Short note public, private and protected members		6	
8	Q11.What is static data member and static member function ? Write its properties. [7]		7	Dec 14

Unit IV Question Bank

Sr. No.	Question	CO No.	Marks	University Year
1	Q1.Explain early and late binding.	CO4	6	
2	Q2.What is Need of operator overloading?		4	
3	Q3.What are rules for operator overloading?		4	Dec 14
4	Q4.Write note on polymorphism.		6	May 15
5	Q5.What are rules for operator overloading ? List the operators which cannot be overloaded. List the operators which cannot be overloaded by using friend function. [6]		6	
6	Q6.Write a program in C++ to overload unary "–" operator using friend function. [7]		7	Dec 14
7	Q7.Write a program that substitutes an overloaded += operator. This operator should allow statements like s1 += s2;		6	
8	Q8 What are the types of inheritance?		6	Dec15,May 16
9	Q9.Explain constructors and destructors in inheritance. Write a program to demonstrate how constructor and destructors are invoked in multilevel inheritance. [6]		6	Dec 14
10	Q10.Write a program to overload assignment operator.		6	
11	Q11.Short note on container classes.		4	
12	Q12.What is pure virtual functions and abstract base class?		6	Dec 13
13	Q13.Difference in early and late binding.		4	May 14
14	Q14.Explain Type conversion.		6	

Unit V Question Bank

Sr. No.	Question	CO No.	Marks	University Year
	Q1.Write a template function that returns the average of all the elements of an array. The arguments to the function should be the array name and the size of the array (type int). In main(), exercise the function with arrays of type int, long, double, and char.	CO4	6	
	Q2.Explain Function template and class template with examples		8	May 15
	Q3.What is Generic Programming?		4	
	Q4.Write a note on Sequence Container, Associative Container and Derived Container.		8	May 15
	Q5.Short note on Exceptions with arguments.		6	
	Q6.Write a program in C++ for bubble sort using function template.		6	Dec 14
	Q7.Write a note on STL. [6].		6	May 15
	Q8.Note on containers, iterators		6	
	Q9.Write stack program using templates.		6	

Unit VI Question Bank

Sr. No.	Question	CO No.	Marks	University Year
1	What is exception handling mechanism in C++ ? Write a program in C++ to handle "divide by zero" exception. [7]	CO4	7	Dec 14
2	Explain Multiple Exceptions.		6	
3	Explain unformatted I/O, formatted I/O.		8	May 14,15
4	Explain Functions use in File Handling		6	
5	Write the file Opening mode.		6	
6	Write C++ program to write student information from file and read it.		6	

HOME ASSIGNMENTS

Sr.No.	Questions	CO. No	Marks	University Year
1	How would you present different steps of problem solving.	CO1	6	Dec 09 May 14
2	What examples can you find to explain different types of operator ?		4	May 16
3	How would you show your understanding of IPO Chart? Explain the structure of IPO chart.		6	Dec 09 May 14
4	Identify difficulties associated with problem solving		6	Dec 10
5	How would you show your understanding of Top down Design.		4	May 16

Unit II

Sr.No.	Questions	CO.No	Marks	University Year
1	How would you use different types of module.	CO2	4	Dec 09
2	How would you use decision logic structure .		6	Dec13, may 16
3	How would you show your understanding of : a) Parameter b) Return value c) Local and global variable d) Sequential logic structure		10	Dec 15
4	How would you show your understanding of difference between Positive logic and negative logic.		6	Dec 15
5	State rules that should be followed while designing a module.		6	May 14

Unit III

Sr.No.	Questions	CO.No	Marks	University Year
1	How would you implement constructor and destructor ?	CO3	6	Dec 14, May 15
2	How would you develop a program in C++ for creating array of student object (for 150 students). Create class student with data members as Roll Number, Name, Address, mobile number and member functions as get data and display data.		8	Dec 14

	Define member function outside class.			
3	How would you compare Procedural Oriented Programming and Object-oriented Programming		6	Dec 14
4	Can you explain what is static data member and static member function ? Write its properties		7	Dec 14
5	Will you state or interpret in your own words benefits of OOP .		5	May 14

Unit IV

Sr.No.	Questions	CO.No	Marks	University Year
1	How would you show your understanding about polymorphism		**6**	May 15
2	What are rules for operator overloading? List the operators which cannot be overloaded. List the operators which cannot be overloaded by using friend function	**CO4**	**6**	Dec 14
3	How would you write types of inheritance?		**6**	Dec15,May 16
4	How can you make use of assignment operator overloading?		**6**	Dec15,May 16
5	How would you compare early and late binding		**4**	May 14

Unit V Home Assignment

Sr.No.	Questions	CO.No	Marks	University Year
1	How would you use Function template and class template with examples	**CO4**	**8**	May 15
2	How would you explain Sequence Container, Associative Container and Derived Container		**8**	May 15
3	How would you solve a program in C++ for bubble sort using class template.		**6**	Dec 14
4	How would you show your understanding about STL		**6**	May 15

5	How would you use constructors and destructors in inheritance demonstrate in multilevel inheritance		**6**	Dec 14
Unit VI Home Assignment				
Sr.No.	**Questions**	**CO.No**	**Marks**	**University Year**
1	How would you solve is exception handling mechanism in C++ ? Write a program in C++ to handle "divide by zero" exception.	**CO4**	**7**	Dec 14
2	How can you make use of unformatted I/O, formatted I/O		**7**	May 14,15
3	How would you show your understanding about file Opening mode.		**6**	May 14,15
4	How would you solve a C++ program for student information from file and read it.		**6**	Dec 14
5	How would you apply Multiple Exceptions explain it with program.		**6**	May 14,15

QUESTION BANK (MCQ)

1. In C++ ..... operator is used for Dynamic memory allocation.
A) Scope resolution
B) Conditional
C) New
D) Membership access

2. Operators such as ..... cannot be overloaded.
A) +
B) ++
C) : :
D) = =

3. The ..... objects have values that can be tested for various error conditions.
A) osstream
B) ofstream
C) stream
D) ifstream

4. Which function return the current position of the get or put pointer in bytes.
A) tellg( )
B) tellp( )
C) tell( )
D) Both A and B

5. The first index number in an array starts with ..... and the index number of an array of size n will be .....
A) 0, n-1
B) 1, n-1
C) 0, n
D) 1, n

6. To overload an operator ..... keyword must be used along with the operator to be overloaded.
A) Over
B) Overload
C) Void
D) Operator

7. Everything defined at the program scope level (ie. outside functions and classes) is said to be .....

A) local scope
B) regional scope
C) global scope
D) static scope

8 - Choose the pure virtual function definition from the following.

A - virtual void f()=0 { }
B - void virtual f()=0 { }
C - virtual void f() {} = 0;
D - None of the above.

9 - Pick up the valid declaration for overloading ++ in postfix form where T is the class name.

A - T operator++();
B - T operator++(int);
C - T& operator++();
D - T& operator++(int);

10 - Which operator is used to resolve the scope of the global variable?

A - –>
B - .
C - *
D - ::

11- An exception is __

A - Runtime error
B - Compile time error
C - Logical error
D - None of the above

12. What is purpose of abstract class ?

A. to provide help with database connectivity.

B. to provide data input to other classes.

C. to provide security to other classes.

D. to provide an appropriate base class from which other classes can inherit.

13. What is default visibility mode for members of classes in C++ ?
A. Private

B. Public

C. Protected

D. Depends

14. How we can define member function outside the class ?
A. Using union

B. Using structure

C. Using pointers

D. Using scope resolution

15. The major goal of inheritance in C++ is ?
A. To facilitate the reusability of code

B. To help modular programming

C. To facilitate the conversion of data types

D. To extend the capabilities of a class

16. Which of the following operates cannot be overloaded?

i) Size of operator (sizeof) ii) Scope resolution Operator

iii) Conditional operator (?:) iv) Assignment Operator (=)

A) i, ii, iii only

B) ii, iii, iv only

C) i, iii, iv only

D) alli, ii, iii, iv

17 What is the difference between protected and private access specifiers in inheritance?

a. private member is not inheritable and not accessible in derived class.

b. protected member is inheritable and also accessible in derived class.

c. Both are inheritable but private is accessible in the derived class.

d. Both are inheritable but protected is not accessible in the derived class.

18 In case of inheritance where both base and derived class are having constructor and destructor, then which if the following are true ?

1. Constructors are executed in their order of derivation
2. Constructors are executed in reverse order of derivation
3. Destructors are executed in their order of derivation
4. Destructors are executed in reverse order of derivation

a. Only 2 ,4

b. Only 1 , 3

c. Only 1 , 4

d. Only 2, 3

19. Consider the following if construct
If(x=0)
cout<<"Inside loop!";
cout<<"Outside loop";
The result of the above code segment is.
a) inside loop
b) outside loop
c) both (a) & (b)
d) none of the above

20. What is wrong with the following statement?
floats_interest (float principal, int rate=0.25, int time);
a) variables must not be specified in function prototype
b) arguments may only be defaulted from right to left
c) the default value must be specified when making a function call
d) none of the above

214446 Digital Laboratory

SYLLABUS

214446: DIGITAL LABORATORY

Group A

Combinational Logic Design

1. Design (truth table, K-map) and implementation of 4-bitBCD to Excess-3 and Excess-3 to BCD Codeconverters.

2. Design (truth table, K-map) and implementation of 4 bit BCD & Excess 3 Adder usingIC7483.

3. Implementation of logic functions using multiplexer IC 74153 & decoder IC 74138.(Verification, cascading & logic function implementation)

Group B

Sequential Logic Design

1. Design (State diagram, state table & K map) and implementation of 3 bit Up and DownAsynchronous and Synchronous Counter using master slave JK flip-flop IC 7476

2. Design and implementation of Module 'n' counter with IC7490 and IC 74191.

3. Design (State Diagram, State Table, K Map) and implementation of Sequence Generator using ShiftRegister IC 74194.

Group C

VHDL Programming

Simulation of

1. 4:1 multiplexer using data flow & structural modeling.

2. Full adder using behavioral & structural modeling.

3. 3 bit controlled up / down synchronous counter with preset & clear

Group D

Design, construct digital logic circuits and analyze their behavior through simulation of any one assignment from either Group A or Group B with simulation software like Digital Works 3.0

COURSE OUTCOMES

No.	Course Outcome	Mapping With Assignment	Assessment Technique	Blooms Taxonomy Category
C214446.1	Apply of K-Map (Min) technique for implementation & design of different combinational Logic circuit using MSI & SSI chips.	Group A : 1,2,3	Continuous Assessment	Applying
C214446.2	Analyse Sequential Circuit and design various problems using synchronous/asynchronous counter	Group B : 1,2		Applying
C214446.3	Design Sequential logic Circuit using counter and shift register	Group B : 3		Applying
C214446.4	Understand and implement design steps, main programming technique through hands on experimentation on Xilinx for any digital circuits with VHDL programming.	Group C : 1,2,3		Applying

TEACHING PLAN

Teaching Plan Short

Academic Year:- 2019-20 Semester :- I w. e. f. :- 15/06/2019

Class : - S.E Division: A/B

Subject :- Digital Laboratory Subject Code :- 214446

Faculty In charge :- Ms. Sonali Deo/ Mrs. PoonamRakibe No. of Practical/ weeks: 2 Hour

- **Practical Plan**

Sr. No.	Assignment No.	Assignment Name	Start week	End week
1.	-	Basic Gates IC Verification	June 3rd Week	June 3rd Week
2.	-	Binary to Gray Code Converter	June 4th Week	June 4th Week
3.	1	BCD to Excess-3 and Excess-3 to BCD code converter	July 1st Week	July 2nd Week
4.	2	BCD and Excess-3 Adder	July 3rd Week	July 4th Week
5.	3	MUX and DEMUX	July 5th Week	August 1st Week
6.	4	Synchronous and Asynchronous counter	August 2nd Week	August 3rd Week
7.	5	MOD Counter	August 4th Week	August 4th Week
8.	6	Sequence generator using Shift Register	September 1st Week	September 1st Week
9.	7	VHDL simulation of 4:1 MUX	September 2nd Week	September 2nd Week
10.	8	VHDL simulation of Full Adder	September 3rd Week	September 3rd Week
11.	9	VHDL simulation of 3-bit controlled up/down counter	September 4th Week	September 4th Week

ORAL QUESTION BANK

1. Why NAND & NOR gates are called universal gates?
2. Realize the EX – OR gates using minimum number of NAND gates.
3. Give the truth table for EX-NOR and realize using NAND gates?
4. What are the different methods to obtain minimal expression?
5. What is a Min term and Max term.
6. State the difference between SOP and POS.
7. What is meant by canonical representation?
8. What is K-map? Why is it used?
9. What are universal gates?
10. What is a half adder?
11. What is a full adder?
12. What are the applications of adders?
13. What is a half subtractor?
14. What is a full subtractor?
15. What are the applications of subtractors?
16. Obtain the minimal expression for above circuits.
17. Realize a full adder using two half adders
18. Realize a full subtractors using two half subtractors.
19. What is the internal structure of 7483 IC?
20. What do you mean by code conversion?
21. What are the applications of code conversion?
22. How do you realize a subtractor using full adder?
23. What is a ripple Adder? What are its disadvantages?

24. What are code converters?
25. What is the necessity of code conversions?
26. What is gray code?
27. Realize the Boolean expressions for
    a) Binary to gray code conversion
    b) Gray to binary code conversion
28. What is a multiplexer?
29. What is a de-multiplexer?
30. What are the applications of multiplexer and de-multiplexer?
31. Derive the Boolean expression for multiplexer and de-multiplexer.
32. How do you realize a given function using multiplexer
33. What is the difference between multiplexer &demultiplexer?
34. In 2n to 1 multiplexer how many selection lines are there?
35. How to get higher order multiplexers?
36. Implement an 8:1 mux using 4:1 muxes?
37. What are the applications of decoder?
38. What is the difference between decoder & encoder?
39. For n- 2n decoder how many i/p lines & how many o/p lines?
40. What are the different codes & their applications?
41. What are code converters?
42. Using 3:8 decoder and associated logic, implement a full adder?
43. Implement a full subtractor using IC 74138?
44. What is the difference between decoder and de-mux?
45. What is the difference between Flip-Flop & latch?
46. Give examples for synchronous & asynchronous inputs?

47. What are the applications of different Flip-Flops?
48. What is the advantage of Edge triggering over level triggering?
49. What is the relation between propagation delay & clock frequency of flip-flop?
50. What is race around in flip-flop & how to over come it?
51. Convert the J K Flip-Flop into D flip-flop and T flip-flop?
52. List the functions of asynchronous inputs?
53. What is the necessity for sequence generation?
54. What are PISO, SIPO, and SISO with respect to shift register?
55. Differentiate between serial data & parallel data
56. What is the significance of Mode control bit?
57. What is a ring counter?
58. What is a Johnson counter?

214447 Programming Laboratory

SYLLABUS

1. Represent sets using one dimensional arrays and implement functions to perform
i. Union
ii. Intersection
iii. Difference
iv. Symmetric difference of two sets

2. Represent matrix using two dimensional arrays and perform following operations **with and without pointers**:
i. Addition
ii. Multiplication
iii. Transpose
iv. Saddle point

3. Implement following operations on string **with / without pointers (without using library functions)**
i. Length
ii. Copy
iii. String comparison
iv. Reverse
v. Palindrome
vi. Concatenation
vii. Substring

4. Create a Database using array of structures and perform following operations on it:
i. Create Database
ii. Display Database
iii. Add record
iv. Search record
v. Modify record
vi. Delete record

5. a) Sort the set of strings in ascending order using Bubble sort and descending order by using Selection sort or Insertion sort. (Display pass by pass output)

b) Search a particular string using binary search **with and without recursion.**

6. Implement sequential file and perform following operations:
i. Display
ii. Add records
iii. Search record
iv. Modify record
v. Delete record

7. Implement Quick Sort / **Merge Sort** to sort the given list of numbers. Display corresponding list in each pass. (with and without recursion)

8. Accept conventional matrix and convert it into sparse matrix using structure and perform **addition**, simple and fast transpose

9. Implement a singly linked list with following options
i. Insertion of a node at any location
ii. Deletion of a node from any location
iii. display a list
iv. Display in reverse
v. Reverse the list without using additional data structure.

10. Implement polynomial using CLL and perform
i. Addition of Polynomials
ii. Multiplication of polynomials
iii. Evaluation of polynomial

11. Implement any database using doubly linked list with following options
i. Insert a record
ii. Delete a record
iii. Modify a record
iv. Display list forward
v. Display list backward

12. Implement Generalized Linked List to create and display the book index.

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Assignment	Assessment Technique	Blooms Taxonomy Category
C214447.1	Apply appropriate constructs of C language, coding standards for application development.	I	MCQ Test	Apply
C214447.2	Make Use of dynamic memory allocation concepts and file handling in various application developments.	II, VI	MCQ Test	Apply
C214447.3	Classify basic analysis of algorithms with respect to time and space complexity.	III	MCQ Test	Classify
C214447.4	Select appropriate searching and/or sorting techniques in the application development	IV	MCQ Test	Apply
C214447.5	Select and use appropriate data structures for problem solving and programming.	V, VI	End Term Test	Apply

TEACHING PLAN

Practical Plan

Academic Year:- 2019-20 Semester :- I w. e. f. :- 15/06/2019

Class : - SE Division: A/B

Subject :- FDS Subject Code :- 214447

Faculty In charge :- Ms. Supriya Jagtap/ Mrs. Mukta Jamage No. of Practical/ weeks: 4 hours

- **Practical Plan**

Sr. No.	Assignment No.	Assignment Title	Batch A, B & C		Batch D
			Start Week	End Week	Start and End Week
1.	1	Set Operations	June Week3	July Week1	Week1
2.	2	Matrix Operations	July Week2	July Week3	Week2
3.	3	String Operations	July Week4	July Week4	Week2
4.	4	Structure Manipulation	July Week5	July Week5	Week3
5.	6	Sequential File Operations	August Week1	August Wee1	Week3
6.	5	Sorting and Searching	August Week2	August Week2	Week4
7.	7	Quick Sort	August Week3	August Week3	Week4
8.	9	SLL	August Week4	September Week4	Week5
9.	10	CLL	September Week1	September Week1	Week5
10.	11	DLL	September Week2	September Week2	Week5
11.	12	GLL	September Week3	September Week3	Week6
12.	8	Sparse Matrix	September Week3	September Week3	Week6

PRACTICAL PRACTICE QUESTIONS

Sr. No.	Assignment No.	Add on problem statement
1	1	Set operation on set of characters
2	2	Matrix Subtraction
3	3	To find out palindrome of string
4	4	Structure with pointers
5	5	Implementation of Insertion sort
6	7	Implement Merge sort

ORAL QUESTION BANK

1. What is a pointer on pointer?
2. Distinguish between malloc() &calloc() memory allocation.
3. What is keyword auto for?
4. What are the valid places for the keyword break to appear.
5. Explain the syntax for for loop.
6. What is difference between including the header file with-in angular braces <> and double quotes " "
7. How a negative integer is stored. What is a static variable?
8. What is a NULL pointer?
9. What is the purpose of extern storage specifier?
10. Explain the purpose of the function sprintf()
11. What is the meaning of base address of the array?
12. When should we use the register storage specifier?
13. S++ or S = S+1, which can be recommended to increment the value by 1 and why?
14. What is a dangling pointer?
15. What is the purpose of the keyword typedef?
16. What is lvalue and rvalue?
17. What is the difference between actual and formal parameters?
18. Can a program be compiled without main() function?
19. What is the advantage of declaring void pointers?
20. Where an automatic variable is stored?
21. What is a nested structure?
22. What is the difference between variable declaration and variable definition?
23. What is a self-referential structure?
24. Does a built-in header file contains built-in function definition?
25. Explain modular programming.
26. What is a preprocessor?
27. Explain the use of %i format specifier w.r.t scanf().
28. How can you print a \ (backslash) using any of the printf() family of functions.
29. Does a break is required by default case in switch statement?
30. When to user -> (arrow) operator.
31. What are bit fields?
32. What are command line arguments?
33. What are the different ways of passing parameters to the functions?
34. Which to use when?
35. What is the purpose of built-in stricmp() function.
36. Describe the file opening mode "w+".
37. Where the address of operator (&) cannot be used?

38. Is FILE a built-in data type?
39. What is reminder for 5.0 % 2?
40. How many operators are there under the category of ternary operators?
41. Which key word is used to perform unconditional branching?
42. What is a pointer to a function? Give the general syntax for the same.
43. Explain the use of comma operator (,).
44. What is a NULL statement?
45. What is a static function?
46. Which compiler switch to be used for compiling the programs using math library with gcc compiler?
47. Which operator is used to continue the definition of macro in the next line?
48. Which operator is used to receive the variable number of arguments for a function?
49. What is the problem with the following coding snippet?
50. Which built-in library function can be used to re-size the allocated dynamic memory?
51. Define an array. What are enumerations?
52. Which built-in function can be used to move the file pointer internally?
53. What is a variable?
54. Who designed C programming language?
55. C is successor of which programming language?
56. What is the full form of ANSI?
57. Which operator can be used to determine the size of a data type or variable?
58. Can we assign a float variable to a long integer variable?
59. What it the return value of a relational operator if it returns any?
60. How does bitwise operator XOR works.
61. What is an infinite loop?
62. Can variables belonging to different scope have same name?
63. If so show an example.
64. What is the default value of local and global variables?
65. Can a pointer access the array?
66. What is a string length?
67. What is the built-in function to append one string to another?
68. Which operator can be used to access union elements if union variable is a pointer variable?
69. Explain about ‘stdin’.
70. Name a function which can be used to close the file stream.
71. What is the purpose of #undef preprocessor?
72. Define a structure. Name the predefined macro which be used to determine whether your compiler is ANSI standard or not?
73. What is typecasting?
74. What is recursion?

75. Which function can be used to release the dynamic allocated memory?
76. What is the first string in the argument vector w.r.t command line arguments?
77. How can we determine whether a file is successfully opened or not using fopen() function?
78. What is the output file generated by the linker.
79. What is the maximum length of an identifier?
80. What is the default function call method?
81. Functions must and should be declared.
82. Comment on this. When the macros gets expanded? Can a function return multiple values to the caller using return reserved word?
83. What is a constant pointer?
84. To make pointer generic for which date type it need to be declared?
85. Can the structure variable be initialized as soon as it is declared?
86. Is there a way to compare two structure variables?
87. Which built-in library function can be used to match a patter from the string?
88. What is difference between far and near pointers?
89. Can we nest comments in a C code?
90. Which control loop is recommended if you have to execute set of statements for fixed number of times?
91. What is a constant?
92. Can we use just the tag name of structures to declare the variables for the same?
93. Can the main() function left empty?
94. Can one function call another?

ADDITIONAL RESOURCES

1. Youtube channel " Techtalks".

214448

Object Oriented programming Lab

SYLLABUS

214448 : OBJECT ORIENTED PROGRAMMING LABORATORY

1. Create a class named weather report that holds a daily weather report with data members day_of_month, hightemp, lowtemp,amount_rain and amount_snow. Use different types of constructors to initialize the objects. Also include a function that prompts the user and sets values for each field so that you can override the default values.
2. A Book shop maintains the inventory of books that are being sold at the shop. The list includes details such as title, author, publisher, price and available stock. Write a program in C++ which will have a class called books with suitable member functions for

   i. Add ii. Update iii. Search a book iv. Purchase a book (update the stock and display the total cost)

   v. Record number of successful/unsuccessful transactions (use static data members to keep count of transactions) Use new operator in constructors to allocate memory space required.
3. Design a class 'Complex 'with data members for real and imaginary part. Provide default and parameterized constructors. Write a program to perform arithmetic operations of two complex numbers using operator overloading.

   i. Addition and subtraction using friend functions

   ii. Multiplication and division using member functions
4. Design a base class with name, date of birth, blood group and another base class consisting of the data members such as height and weight. Design one more base class consisting of the insurance policy number and contact address. The derived class contains the data members' telephone numbers and driving license number.

   Write a menu driven program to carry out the following things:

   i. Build a master table ii. Display iii. Insert a new entry

   iv. Delete entry v. Edit vi. Search for a record

5. Create a base class shape with two double type values and member functions to input the data and compute_area() for calculating area of figure. Derive two classes' triangle and rectangle. Make compute_area() as a virtual function and redefine this function in the derived class to suit their requirements.

   Write a program that accepts dimensions of triangle/rectangle if dimensions are negative throw exception "Take Correct Input" and write catch block to handle the exceptions thrown and take input again and display calculated area.

6. Write a program in C++ which includes the code for following operations:

   i. A function to read two double type numbers from keyboard

   ii. A function to calculate the division of these two numbers

   iii. A try block to detect and throw an exception if the condition "divide-by-zero" occurs

   iv. Appropriate catch block to handle the exceptions thrown

7. Write a program in C++ using function/class template to read two matrices of different data types such as integers and floating point values and perform simple arithmetic operations on these matrices separately and display it.

8. Write a program in C++ to implement sequential file for students' database and perform following operations on it

   i) Create Database ii) Display Database iii) Add a record iv) Delete a record v) Modify a record

9. Create employee bio-data using following classes i) Personal record ii) Professional record iii) Academic record. Assume appropriate data members and member function to accept required data & print bio-data. Create bio-data using multiple inheritances using C++.

10. File handling in C++ (with Command Line Arguments for TYPE and COPY command)

    OR

    Write a C++ program that creates an output file, writes few records into it, closes the file and open it again as an input file and read the information from the file

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Assignment	Assessment Technique	Blooms Taxonomy Category
C214448.1	Break a problem into logical pieces and develop algorithms for solving simple problems	All	Lab Test	Create
C214448.2	Abstract data and entities from the problem domain, build object models and design softwaresolutions using object-oriented principles and strategies.	All	Lab Test	Develop
C214448.3	Discover, explore and apply tools and best practices in object-oriented programming.	Assignment 7	Lab Test	Develop
C214448.4	Develop programs that appropriately utilize key object-oriented concepts.	All	Lab Test	Develop

TEACHING PLAN

Teaching Plan Short

Academic Year:-2019-20 Semester :-I w. e. f. :-15/6/19

Class : - SE Division:A&B

Subject :-OOPL Subject Code :-214448

Faculty In charge :-RS and AB No. of Lectures/ weeks: 4

- **Practical Plan**

Sr. No.	Assignment No.	Assignment Name	Start Date	End Date
1.	I	Generation of monthly Weather Report	25.6.2018	6.7.2018
2.	II	Book shop maintenance for the inventory of books	9.7.2018	20.7.2018
3.	III	Perform arithmetic operations of two complex numbers usingoperator overloading.	23.7.2018	27.7.18
4.	IV	Menu driven Program to perform Multiple Inheritance	30.7.2018	03.08.2018
5.	V	Assignment on Virtual functions	06.08.2018	10.08.2018
6.	VI	Assignment on Exception Handling	13.08.2018	17.08.2018
7	VII	Matrix operations usingTemplates	20.08.2018	31.08.2018
8	VIII	Menu driven Program for File handling	27.08.2018	07.09.2018
9	IX	Generation of Bio-Data using multiple inheritance	11.09.2018	15.09.2018
10	X	File handling in C++ (TYPE and COPY command)	18.09.2018	22.09.2018

PRACTICAL PRACTICE QUESTIONS

1. C++ Program to Find All Roots of a Quadratic Equation
2. C++ program for employee database, accept, display and calculate salary.
3. A program to print student details using constructor and destructor
4. Implement the matrix ADT presented in the problem-11 using overloaded operators (<<, >>, +, -, *) and templates.
5. C++ program for function overloading for addition of int, float and complex number.
6. C++ program to add two numbers using function template.
7. C++ program to add two numbers using class template.
8. C++ program to overload template function for sum of numbers.
9. C++ program Swap Data Using Function and classTemplates
10. C++ program multiple catch statement in exception handling.
11. File handling program for students data base accept, display and display results.

ORAL QUESTION BANK

1. What is a class?
2. What is an object?
3. List the types of inheritance supported in C++.
4. What is the role of protected access specifier?
5. What is encapsulation?
6. What is abstraction?
7. What is inheritance?
8. Explain the purpose of the keyword volatile.
9. What is an inline function?
10. Mention the storage classes names in C++.
11. What is the role of mutable storage class specifier?
12. Distinguish between shallow copy and deep copy.
13. What is a pure virtual function?
14. What is an abstract class in C++?
15. What is a reference variable in C++?
16. What is role of static keyword on class member variable?
17. What are/is the operator/operators used to access the class members?
18. Can we initialize a class/structure member variable as soon as the same is defined?
19. What is the data type to store the Boolean value?
20. What is function overloading?
21. What is operator overloading?
22. Do we have a String primitive data type in C++?
23. Name the default standard streams in C++.
24. Which access specifier/s can help to achive data hiding in C++?

25. What is a destructor? Can it be overloaded?
26. What is a constructor?
27. What is a default constructor? Can we provide one for our class?
28. Which operator can be used in C++ to allocate dynamic memory?
29. What is the purpose of 'delete' operator?
30. Can I use malloc() function of C language to allocate dynamic memory in C++?
31. Can I use 'delete' operator to release the memory which was allocated using malloc() function of C language?
32. What is a friend function?
33. What is a copy constructor?
34. Does C++ supports exception handling? If so what are the keywords involved in achieving the same.
35. Explain the pointer – this.
36. What is the difference between the keywords struct and class in C++?
37. Can we implement all the concepts of OOPS using the keyword struct?
38. What is the block scope variable in C++?
39. What is the role of the file opening mode ios::trunk?
40. What is the scope resolution operator?
41. What is a namespace?
42. What are command line arguments?
43. What is a class template?
44. How can we catch all kind of exceptions in a single catch block?
45. What is a static variable?
46. Where an automatic variable is stored?
47. What is a container class?
48. What is a token?

49. What is a preprocessor?
50. What are command line arguments?
51. What are the different ways of passing parameters to the functions? Which to use when?
52. What is the default function call method?
53. What are available mode of inheritance to inherit one class from another?
54. What is the difference between delete and delete[]?
55. Does an abstract class in C++ need to hold all pure virtual functions?
56. Is it legal to assign a base class object to a derived class pointer?
57. What happens if an exception is thrown outside a try block?
58. Are the exceptions and error same?
59. What is function overriding?
60. Which function is used to move the stream pointer for the purpose of reading data from stream?
61. Which function is used to move the stream pointer for the purpose of writing data from stream?
62. Are class functions taken into consideration as part of the object size?
63. Can we create and empty class? If so what would be the size of such object.What is 'std'?
64. What is the full form of STL?
65. What is 'cout'?
66. What is 'cin'?
67. What is the use of the keyword 'using'?
68. If a pointer declared for a class, which operator can be used to access its class members?
69. What is difference between including the header file with-in angular braces <> and double quotes " "
70. What is the difference between variable declaration and variable definition?
71. Which key word is used to perform unconditional branching?

72. What is a virtual destructor?

73. What is the order of objects destroyed in the memory?

214449

Communication Skills

SYLLABUS

UNIT I: ESSENTIAL GRAMMAR AND PHONETICS (05 Hours)

Tenses: Basic forms and use, sentence formation (general & Technical), Common errors, Parts of speech through context, Direct and reported speech structures and voices, stress & intonation, voice modulation, exercises on pronunciation, use of software for exercises on pronunciation.

Activities:-

The class of students will always have some students with adequate knowledge of basic grammar and rest with no/poor knowledge.

• The basic grammar exercises can be taught by giving students sentences in their mother tongue and telling them to convert it to English thereby covering parts of speech, tenses, voices, etc

• The students with acceptable understanding of grammar can be engaged in some advanced grammar exercises like the ones in 'word power made easy' or any online exercises mentioned in the references below.

• For intonation, voice modulation, videos by decent orators /movie clips can be shown to the students.

• For pronunciation, exercises based on Homonyms, homophones can be conducted.

UNIT II: VOCABULARY ENRICHMENT (05 Hours)

Exposure to words from General Service List (GSL) by West, Academic word list (AWL) by AverilCoxhead (2000) and specific technical terms related to the field of Information technology. Phrases, idioms, proverbs, significant abbreviations, formal (business) vocabulary.

Activities:-

• Students should be given 10 idioms, proverbs and phrases each and should be told to form story using them.

• Students can be divided into teams. Each team should be told to find out 10 new words/phrases the meanings of which should be discussed in the lab. This exercise can be repeated in the last 10 minutes of each lab session so as to add to the students' vocabulary.

UNIT III: WRITING SKILLS

Letter Writing - Business letters, Application letters, Covering letters, Report Writing -Academic and Business reports, Technical Project writing, Job application letter and Resume writing

Activities:- students should be made to write letters in formal and informal way like letters, resume, technical report writing.

UNIT IV: LISTENING SKILLS **(05 Hours)**

Types of listening, Levels of Listening, Listening Barriers, Listening Ethics, activities to strengthen students' listening skills.

Activity:-Chinese whisper

Audio activity:-students should listen to any audio and try to answer question based on that audio.

UNIT V: READING SKILLS

Definition, need for reading Skills, techniques for reading, how to develop fluency in Reading.

Lab Activities:

Students can be given some text to read and answer questions related to that text.

Students can be made to read a passage aloud and others can be asked questions based on the passage read.

UNIT VI: SPEAKING SKILLS

Difference between talking and Speaking, Attributes /characteristics of public speaking, barriers to effective speaking, Types of speaking: Technical and Non-Technical speaking.

Teachers should make use of software and web-based applications for giving exercises on grammar to students. The term work shall consist of 10 activities carrying 10 marks each. The total marks earned by the students out of 100 will be scaled down to 50. The online exam and term work marks will be further scaled down to 50. Students will have to submit journals or files containing record of each activity performed in laboratory, at the term end.

Activities:

1. Prepared speech (topics are given in advance, students get 10 minutes to prepare the speech and 5 minutes to deliver.

• Extempore speech (students deliver speeches spontaneously for 5 minutes each on a given topic)

• Story telling (Each student narrates a fictional or real life story for 5 minutes each)

• Oral review (Each student orally presents a review on a story or a book read by them)

2. Power-point Presentations

Students should make a presentation on any informative topic of their choice. The topic may be technical or non-technical.

3. Formal Group Discussion

Each batch is divided into two groups of 12 to 14 students each. Two rounds of a GD for each group should be conducted and teacher should give them feedback.

4. Mock Meetings

In order to enhance students' formal oral communication, mock meetings can be conducted. Teacher should give a topic for the meeting and teach students how a notice and agenda for a

meeting is prepared. Students will participate in the meeting assuming the roles assigned by the teacher. After the meeting, teacher should guide students on how minutes of meeting are recorded.

5. Reading and Listening skills

The batch can be divided into pairs. Each pair will be given an article (any topic) by the teacher. Each pair would come on the stage and read aloud the article one by one. After reading by each pair, the other students will be asked questions on the article by the readers. Students will get marks for correct answers and also for their reading skills. This will evaluate their reading and listening skills. The teacher should give them guidelines on improving their reading and listening skills.

6. Pronunciation through software or web-based applications

Teachers should make use of software and web-based applications for giving exercises on pronunciation to students.

7. Vocabulary exercises through web-based applications

Teachers should make use of software and web-based applications for giving exercises on vocabulary to students.

8. Letter, Report & review writing

Each student will write a formal letter, one report and a review on the topics given by the teacher.

9. Grammar exercises through web-based applications

Teachers should make use of software and web-based applications for giving exercises on grammar to students. The term work shall consist of 10 activities carrying 10 marks each. The total marks earned by the students out of 100 will be scaled down to 50. The online exam and term work marks will be further scaled down to 50. Students will have to submit journals or files containing record of each activity performed in laboratory, at the term end.

REFERENCES

1. Rutherford A. J., "Communication skills for Technical Communication", Pearson Education

2. Meenakshi Raman, Sangeeta Sharma, "Technical Communication – Principles and practice", Oxford

3. Kishna Mohan, "Developing Communications Skills", MacMillan Publishers, 2nd Edition

4. M.S. Rao, "Strategies for improving your business communication", SPD

5. Murphy, "Essential English Grammar", Cambridge

6. Duttet.al, "A course in Communication Skills", Foundation Books

7. PriyadarshaniPatnaik, " Group Discussion and Interview Skills", 1st edition, Foundation Books.

8. Peter Roach, " English Phonetics and Phonology", 4th Edition, Cambridge.

9.Lynch,"listening",, Cambridge

10.Malcom Goodale, " Professional Presentations", Cambridge

11.Ham-Lyons &Heasley, "Writing", 2nd Edition, Cambridge

12."Idioms and proverbs are fun", Wilcobooks(author)

13. Whitbeck, " Ethics in Engineering Practice and Research", Cambridge, ISBN-9780521897976

14. Chauhan, "Soft Skills: An Integrated Approach to Maximize", Wiley, ISBN-9788126556397

15. Mishra, "Communication Skills for Engineers", 2e, ISBN – 9788131733844, Pearson

ESL Sites (Web-based applications) for vocabulary learning

1.http://www.nottingham.ac.uk/%7Ealzsh3/acvocab/awlhighlighter.htm

2.http://www.visuwords.com/

3.http://www.vocabulary.com/

4.http://www.uefap.com/vocab/exercise/exercise.htm

5. www.englishvocabularyexercises.co

COURSE OUTCOMES

CO No.	Course Outcome	Mapping With Unit	Assessment Technique	Blooms Taxonomy Category
CO214449.1	Develop proficiency in oral, written and listening communication	III, IV	Group Discussion, Resume Writing	Applying
CO214449.2	To find current tools associated with the communication field	I, II	Presentation	Remembering
CO214449.3	To improve formal and informal way of communication among students	VI	Interview Session	Creating
CO214449.4	To develop effective reading skills in various styles.	V	Book Review	Creating

PREREQUISITES

Sr. No	UNIT	PREREQUISITES
1	UNIT 1: ESSENTIAL GRAMMAR AND PHONETICS	Basic knowledge of English Language
2	Unit II: VOCABULARY ENRICHMENT	Basic knowledge of English Language
3	Unit III: WRITING SKILLS	Basic knowledge of English Language
4	Unit IV: LISTENING SKILLS	Basic knowledge of English Language
5	Unit V: READING SKILLS	Basic knowledge of English Language
6	Unit VI: SPEAKING SKILLS	Basic knowledge of English Language

TEACHING PLAN

TEACHING PLAN (Practical)

Academic Year:-2019-20 Semester: - I w. e. f.:- 15/6/2019

Class: - SE Division: A, B

Subject: - Communication Skills Subject Code: - 214449

Faculty In charge: - Mrs. Suhasini L. Bhat No. of Practical/ weeks: 2

Sr. No.	Assignment No.	Assignment Title	Start	End
1.	1	Essential Grammar	3rd week (June)	4th week (June)
2.	1.1	Tenses	5th week (June)	1st week (July)
3.	1.2	Phonetics	2nd week (July)	3rd week (July)
4.	2	Vocabulary Enrichment	4th week (July)	1st week (August)
5.	2.1	Word Exposure	2nd week (August)	3rd week (August)
6.	3	Writing Skills	4th week (August)	5th week (August)
7.	4	Listening Skills	1st week (September)	1st week (September)
8.	5	Reading Skills	2nd week (September)	2nd week (September)
9.	6	Speaking Skills	3rd week (September)	3rd week (September)
10.	7	Listening, Speaking, Writing, Reading (LSWR)	4th week (September)	4th week (September)

Interview Question Bank

General Interview Questions

Q1 − Tell me about yourself.

Q2 − What are your greatest strengths?

Q3 − What are your greatest weaknesses?

Q4 − Tell me about an incident you are ashamed of speaking about

Q5 − Why did you leave (or plan to leave) your present employer?

Q6 − The Silent Treatment

Q7 − Why should I hire you?

Q8 − Where do you see yourself five years from now?

Q9 − Why do you want to work at our company?

Q10 − Would you lie for the company?

Q11 − Questions on confidential matters.

Behavioral Interview Questions

Q1 − Describe a bad experience you had working with your ex-employer

Q2 − Describe how you handle disagreement.

Q3 − Explain a situation when you explained a complex idea simply.

Q4 − Describe a time when you had to adapt to a change at work.

Q5 − Describe a time when you made a mistake.

Q6 − Describe a time when you delegated tasks to team-mates.

Q7 − Describe when you were blamed for somebody else's mistake.

Q8 − Describe a difficult situation that you faced and how you handled it.

Q9 − Describe a new suggestion that you had made to your supervisor

Q10 − Describe when you had to take a judgement on a difficult decision.

Role-Play Interview Questions

Q1 − Sell me this pen.

Q2 − Introduce yourself as a kitchen gadget.

Q3 − Create a "bits-and-pieces" organization from your pocket(s).

Q4 − Listen to our conversation and repeat our preferences.

Q5 − Create a metaphorical or symbolic representation of yourself from the following items

- Pairs of scissors
- Nuts and bolts
- Screw-drivers
- Small children's toys
- Coins

Brainteaser Interview Questions

Q1 − You're in a room with three light switches, each of which controls one of the three light bulbs in the next room. Find out which switch controls which bulb. All lights are initially off, and you cannot see into one room from the other. You can check the room only once. How can you determine which switch is connected to which light bulb?

Q2 − Here's a mobile phone. Deconstruct it for me.

Q3 − An apple costs 40 cents, a banana costs 60 cents, and a grapefruit costs 80 cents. How much does a pear cost?

Q4 − Describe the Internet to someone who woke up from a 30-year coma.

Q5 − A scientist puts a bacteria in a petri dish at exactly noon. Every minute, the bacteria divides into two. At exactly 1 pm, the petri dish is full. At what time was the dish half full?

Q6 − Is it better to be perfect and late, or good and on time?

Q7 − "Who is the smartest person you know personally? Why?"

Q8 − You wake up early one morning and find the light in your bedroom is broke. You get dressed in the dark. Your drawer has socks of three different colors: red, yellow, and blue. How many socks do you have to take out to be certain of having a matching pair?