PROGRESSIVE EDUCATION SOCIETY'S

MODERN COLLEGE OF ENGINEERING

1186A, SHIVAJINAGAR, OFF J.M, PUNE-411005

(AFFILIATED TO SAVITRIBAI PHULE PUNE UNIVERSIT, PUNE)

DEPARTMENT OF ELECTRICAL ENGINEERING

E-CURRICULUM BOOKLET

ACADEMIC YEAR: 2019-20

FOR THE PROGRAMME

SE – ELECTRICAL ENGINEERING

(SEMISTER-II)

QUALITY POLICY OF THE INSTITUTE

We, PES Modern College of Engineering are committed to develop and foster cultured and promising professionals by imparting quality education in the field of Engineering and Management.

VISION OF THE INSTITUTION

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

MISSION OF THE INSTITUTE

1. **To develop outstanding engineers & 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 levels and environmental conditions.**
5. **To foster and maintain mutually beneficial partnerships with alumni and industry.**

QUALITY POLICY OF THE DEPARTMENT

Electrical Engineering department is committed to develop promising engineers with ethical and social responsibility through excellence in academics, research, skill development and consultancy.

VISION OF THE DEPARTMENT

To build technically competent Electrical Engineers with ethical and social responsibility.

MISSION OF THE DEPARTMENT

- **To develop abilities in students for acquiring knowledge and skills to flourish in dynamic technical environment.**
- **To nurture cultured professionals by providing facilities for their overall development.**
- **To motivate the students for research work and activities beneficial to society.**
- **To enhance strong bonding with various organization and alumni.**

Program Educational Objectives (PEOs)

Graduates will be able to:

PEO 1: Solve and analyze problems in Electrical Engineering using fundamental knowledge.

PEO 2: Adopt lifelong learning ability by acquiring various skills.

PEO 3: Practice ethically in their profession.

PEO 4: Achieve global competency through interactions with various industries, research and professional organizations.

PROGRAM OUTCOMES (POs)

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, research literature, and analyses complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3. 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.

PO4. Conduct investigations of complex problems: The problems that cannot be solved by straight forward application of knowledge, theories and technique applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement. (Like: cost, power requirement, durability, product life, etc.). Which need to be defined (modeled) within appropriate mathematical framework that often requires use of modern computational concepts and tools.

PO5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. 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.

PO7. 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.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10. 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.

PO11. 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.

PO12. 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.

PROGRAM SPECIFIC OUTCOMES:

PSO 1: Students will have skill set in Energy Audit, Design of Solar System, and Automation in PLC and SCADA Applications, Microcontroller and analysis for power quality in Power System.

PSO 2: Students will be capable of dealing with techno-commercial aspect in Electrical Engineering.

CORE VALUES

- Excellence in the field of Electrical Engineering.
- Social responsibility with integrity.
- Lifelong Learning.
- Unity in Diversity.

SHORT TERM GOALS

- To enhance alumni interaction.
- To develop innovation lab to enhance research and entrepreneurship by providing various facilities.

LONG TERM GOALS

- To promote consultancy activity for revenue generation by developing high-tech standard laboratory.
- To encourage the faculty for research work and up gradation of qualifications.
- To enhance teaching-learning process through ICT.
- To establish competitive entrance exam cell in department.

INDEX

PROGRESSIVE EDUCATION SOCIETY'S

MODERN COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING

Course Structure

SavitribaiPhule Pune University
S.E. Electrical Engineering 2015 – Course
(w. e. f. 2016-2017)

Semester I													
Sr. No.	Subject Code	Subject Title	Teaching Scheme			Semester Examination Scheme of Marks						Credit	
						Paper		TW	PR	OR	Total	TH/ TUT	PR+OR
			Th.	Tut.	Pr.	In Sem(Online)	End Sem						
1.	203141	Power Generation Technologies	04	--	--	50	50	--	--	--	100	04	---
2.	207006	Engineering Mathematics-III	04	01	--	50	50	25	--	--	125	05	---
3.	203142	Material Science	04	--	02	50	50	--	--	50	150	04	01
4.	203143	Analog and Digital Electronics	04	--	02	50	50	25	50	--	175	04	01
5.	203144	Electrical Measurements and Instrumentation	04	--	02	50	50	25	50	--	175	04	01
6.	203151	Soft Skills	--	--	02	--	--	25	--	--	25	--	01
										Total		21	04
7.	203154	Audit Course I	--	--	--	--	--	--	--	--	--	Grade: PP/NP	
	Total		20	01	08	250	250	100	100	50	750	25	

Semester II													
Sr. No.	Subject Code	Subject Title	Teaching Scheme			Semester Examination Scheme of Marks						Credit	
						Paper		TW	PR	OR	Total	TH/ TUT	PR+OR
			Th.	Tut.	Pr.	In Sem (Online)	End Sem						
1.	203145	Power System I	04	--	--	50	50	--	--	--	100	04	--
2.	203146	Electrical Machines I	04	--	02	50	50	25	50	--	175	04	01
3.	203147	Network Analysis	04	--	02	50	50	50	--	--	150	04	01
4.	203148	Numerical Methods and Computer Programming	04	01	02	50	50	25	50	--	175	05	01
5.	203149	Fundamentals of Microcontroller and Applications	04	--	02	50	50	--	--	50	150	04	01
										Total		21	04
6.	203155	Audit Course II										Grade: PP/NP	
Total			20	01	08	250	250	100	100	50	750	25	

TW: Term Work **OR:Oral** **PR:** Practical
PP: Passed (Only for non-credit courses) **NP:** Not Passed (Only for non-credit courses)

POWER SYSTEM-I

Name of the Subject – POWER SYSTEM I

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	04	-	-

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
50	50	-	-	-	100	

Unit 01 : Structure of Electrical Power Systems and tariff: (8 Hrs)

A) **Structure of Electrical Power Systems**: Structure of Electrical Power System, Different factors associated with generating stations such as Connected load, Maximum Demand, Demand Factor, average load, load factor, diversity factor, plant capacity factor, reserve capacity, plant use factor, Load curve, load duration curve, concept of base load and peak load stations, Interconnected grid system. Fitting of available generating stations into the area load duration curve.

B) **Tariff** : Introduction of Tariff, Tariff setting principles, desirable characteristics of Tariff, various consumer categories and implemented tariffsuch as two part, three part, Time of Day tariff for H.T. & L.T. industrial and commercialconsumers along with current electricity charges, Introduction to Availability Based Tariff (ABT), Interruptible tariff, Incentives and penalties applied to various consumers.

Unit 02: Major Electrical Equipment's in Power Stations and Overhead line Insulators : (8 Hrs)

A) **Major Electrical Equipment's in Power Stations** : Descriptive treatment of ratings of various equipment used in power station, Special features, field of use of equipment like alternators, necessity of exciters, various excitation systems such as dc excitation, ac excitation and static excitation systems, transformers, voltage regulators, bus-bars, current limiting reactors, circuit breakers, protective relays, current transformers, Potential transformers, Lightning arresters, Earthingswitches, isolators, carrier current equipment (P.L.C.C.), Control panels, battery rooms, metering and other control room equipment in generating stationcourse))

B) Overhead Line Insulators: Types of insulators & their applications such as pin type, suspension type, strain type, Silicon Rubber insulators, post insulators, Shackle insulators, bushings, voltage distribution along string of suspension insulators, string efficiency, equalization of potential across each unit, method of improving string efficiency, Insulator failure.

Unit 03 : Mechanical Design of Overhead Lines and Underground Cables: (8 Hrs)

A) Mechanical Design of Overhead Lines: Main components of overhead lines, Line supports, conductor spacing, length of span, calculation of sag for equal and unequal supports and effect of ice and wind loadings.

B) Underground Cables: Classification, Construction of cable, XLPE cables, insulation resistance, dielectric stress in single core cable, capacitance of single core and three core cable, cables used for HVDC transmission. Grading of cables, inter sheath

Unit 04 : Resistance and Inductance of Transmission Line: (9 Hrs)

Resistance of transmission line, skin effect and its effects, proximity effect, internal & external flux linkages of single conductor, inductance of single phase two wire line, inductance of three phase line with symmetrical and unsymmetrical spacing, concept of G.M.R. and G.M.D, necessity of transposition, inductance of three phase double circuit line with symmetrical and unsymmetrical spacing, inductance of bundled conductors.

Unit 05 : Capacitance of Transmission Line: (7 Hrs)

Electric potential at single charged conductor, potential at conductor in a group of charged conductors, capacitance of single phase line, Capacitance of single phase line with effect of earth's surface on electric field, Concept of G.M.R. and G.M.D for capacitance calculations, capacitance of three phase line with symmetrical and unsymmetrical spacing, capacitance of double circuit three phase line with symmetrical and unsymmetrical spacing

Unit 06 : Performance of Transmission Lines: (8 Hrs)

Classification of lines based on length and voltage levels such as short, medium and long lines. Performance of short transmission line with voltage current relationship and phasor diagram, Representation of medium lines as 'Nominal Pi' and 'Nominal Tee' circuits using R, L and C parameters.

Ferranti effect, Representation of 'Tee' and 'Pi' models of lines as two port networks, evaluation and estimation of generalized circuit constants (ABCD) for short and medium lines, Estimation of Efficiency & regulation of short & medium lines.

Course Objectives

- To understand construction and working of DC machines, transformers.
- To study various speed control methods of d. c. motors.
- To impart various applications of d. c. motors.
- To understand methods to determine regulation and efficiency of d. c. machines and transformers.

Course Outcomes

After successfully completing the course students will be able to:

1. Interpret and calculate inductance and capacitance for different configurations of transmission lines in power systems.
2. Relate the theoretical knowledge of power system with the real time power networks
3. Distinguish consumers, Apply different tariff structures and compute the electricity bills
4. Define different factors associated with generating station and can demonstrate its application in problem solving
5. Design mechanical structure of overhead transmission lines and evaluate the efficiency of different components.
6. Analyze the performance of transmission lines & can estimate the performance parameters

Academic Activity Planner

Units	MCQ Test 1 (20 marks)	MCQ Test 2 (15 marks)	Test 3 (10 marks)	End Term Test (30marks)
I	✓			
II	✓			
III		✓		
IV		✓	✓	
V				✓
VI				✓

Teaching Plan

Teaching plan as per University Syllabus

Sr.No.	Unit	Broad Topics to be Covered	Total Lecture Planned
1	I	Structure of Electrical Power Systems: A] Structure of electrical power system B] Tariff	08
2	II	A] Major Electrical Equipment's in Power Stations B] Overhead Line Insulators	09
3	III	A]Mechanical Design of Overhead Lines B] Underground Cables	08
4	IV	Resistance & Inductance of transmission line	09
5	V	Capacitance of transmission line	08
6	VI	Performance of transmission line	08

Unit wise Lecture Plan

Unit No.-I: Structure of Electrical Power Systems:

A] Structure of electrical power system
B] Tariff

Pre-requisites:-

- Basic concepts of Power generation

Objective:-

- To learn basic structure of electrical power systems, various electrical terms related with power system
- To understand various types of tariffs.

Outcome:

- Recognize different patterns of load curve, calculate different factors associated with it
- Tariff structure for LT and HT consumers

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	General Introduction about Subject ,and its importance	T4,T3 and R1	BB
2	Structure of Electrical Power System, Different factors associated with generating stations such as Connected load, Maximum Demand, Demand Factor	T4,T3 and R1	BB
3	Average load, load factor, diversity factor, plant capacity factor, reserve capacity, plant use factor	T4,T3 and R1	BB
4	Load curve & Numerical	T4,T3 and R1	BB
5	Load duration curve, concept of base load and peak load stations, Interconnected grid system. Fitting of available generating stations into the area load duration curve. B	T4,T3 and R1	BB
6	Introduction of Tariff, Tariff setting principles, desirable characteristics of Tariff,	T4,T3 and R1	BB
7	Various consumer categories and implemented tariff such as two part, three part, Time of Day tariff for H.T. & L.T. industrial and	T4,T3 and	BB

	commercial consumers along with current electricity charges	R1	
8	Introduction to Availability Based Tariff (ABT), Interruptible tariff, Incentives and penalties applied to various consumers.	T4,T3 and R1	BB

Question Bank: Theory

1. Explain how the load duration curve can be plotted from the load characteristics, What information can be obtained from load duration curve?
2. Explain in brief various incentives and penalties offerd by MSPDCL.to various types of consumer.
3. Explain base load plant and peak load plant in brief.
4. What are the essential requirement of good tariff?
5. Write short note on HT/ LT consumer line.
6. Define the term
   A) Maximum Demand
   B) Diversity factor
   C) Load factor
   D) Plant capacity factor
   E) Average demand
   F) Plant use factor

Unit No.-II: A] Major Electrical Equipment's in Power Stations

B] Overhead Line Insulators

Pre-requisites:- Knowledge about electrical Equipment's like transformer, CT, PT, insulators

Objectives: - To learn different electrical equipment's used in power systems and overhead lines

Outcomes: - After successfully completing this unit students will be able:
Give Descriptive treatment of ratings of various equipment used in power station, types of insulators used in power system overhead lines

Lecture No.	Details of the Topic to be covered	References	Mode of delivery
1	**Major Electrical Equipment's in Power Stations :** Descriptive treatment of ratings of various equipment used in power station	**T1,T2 and R1**	Chalk and talk ,PPT
2	Special features, field of use of equipment like alternators, necessity of exciters, various excitation systems such as dc excitation, ac excitation and static excitation systems	**T1,T2 and R1**	Chalk and talk ,PPT
3	Transformers, voltage regulators, bus-bars, current limiting reactors, circuit breakers, protective relays, current transformers, Potential transformers, Lightning arresters, Earthing switches, isolators, carrier current equipment (P.L.C.C.),	**T1,T2 and R1**	Chalk and talk and PPT
4	Control panels, battery rooms, metering and other control room equipment in generating stations.	**T1,T2 and R1**	PPT
5	**Overhead Line Insulators:** Types of insulators & their applications such as pin type	**T1,T2 and R1**	PPT
6	suspension type, strain type, Silicon Rubber insulators, post insulators, Shackle insulators	**T1,T2 and R1**	PPT
7	voltage distribution along string of suspension insulators, string efficiency, numerical	**T1,T2 and R1**	PPT
8	Equalization of potential across each unit, method of improving string efficiency, insulator failure.	**T1,T2 and R1**	PPT

Question Bank: Theory

1. Explain with neat diagram typical generation transmission layout
2. Explain in brief necessity working of major equipments like circuit breakers isolators,bus bar reactor and control panels.
3. Discuss the various properties of insulator and the insulating material used.
4. Write a short note on PLCC.
5. What is string Efficiency and explain method of calculating string efficiency.
6. Why the guard ring method improves the string efficiency of substation. Justify.

Unit No.-III: A] Mechanical Design of Overhead Lines
B] Underground Cables

Pre-requisites:- Knowledge about resistance, inductance, capacitance and impedance.

Objectives: - To learn different method of measurement of Resistance & Inductance.

Outcomes: - After successfully completing this unit students will be able to:

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Mechanical Design of Overhead Lines :Main components of overhead lines, Line supports,	T1,T2 and R1	Chalk and talk ,PPT
2	conductor spacing, length of span, calculation of sag for equal	T1,T2 and R1	Chalk and talk ,PPT
3	Unequal supports and effect of ice and wind loadings.	T1,T2 and R1	Chalk and talk
4	Numerical's on effects of ice and wind loadings	T1,T2 and R1	PPT
5	Underground Cables: Classification, Construction of cable, XLPE cables	T1,T2 and R1	PPT
6	Capacitance of single core and three core cable, cables used for HVDC transmission.	T1,T2 and R1	PPT
7	Grading of cables, inter sheath grading, capacitance grading.	T1,T2 and R1	Chalk and talk
8	Numerical's	**T1,T2**	Chalk and talk

Question Bank: Theory

1. Explain the effect of sag?
2. What are the different factors affecting the sag of transmission line.Derive an expression for the sag when supports are at unequal level.
3. Derive the expression for capacitance of a 3 core cable system
4. Write a short note on XLPE cable
5. Explain in details the classification of cables.
6. Draw the cross sectional view of single core cable and explain the construction.
7. The concentric cable has core diameter 0.8 cm.,shath diameter 3.2 cm.If the cable is tested with 33 KV voltage calculate maximum and minimum stress.
8. What is the grading of cables.Explain any one method.

Unit No.-IV: Resistance and Inductance of Transmission line

Pre-requisites:- Understanding of resistance and inductance of transmission line

Objectives:- To get the concept of GMR,GMD, resistance and inductance of three phase double circuit line and bundled conductor..

Outcomes:- After successfully completing this unit students will analyses and apply knowledge of resistance of transmission line and inductance determination.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Resistance of transmission line, skin effect and its effects	Chalk and talk	T4,T2 and R1
2	Proximity effect, internal & external flux linkages of single conductor	Chalk and talk	T4,T2 and R1
3	Inductance of single phase two wire line, inductance of three phase line with symmetrical and unsymmetrical spacing	Chalk and talk	T4,T2 and R1
4	Concept of G.M.R. and G.M.D, necessity of transposition	Chalk and talk	T4,T2 and R1
5	Inductance of three phase double circuit line with symmetrical and unsymmetrical spacing, inductance of bundled conductors.	Chalk and talk	T4,T2 and R1

Question Bank: Theory

1. Explain the transposition of conductors in transmission line and how it will affect the inductance of transmission line
2. What are the requirements of good conductor in transmission line?
3. State and explain the factors affecting design of transmission line
4. Write a shore note on skin effect and proximity effect.
5. Drive the expression of three phase overhead transmission line when conductors are unsymmetrically spaced but transposed.
6. Derive an expression for loop inductance of a single phase two wire overhead transmission line with conductors separated by a distance ‘d ‘meter and radius of each conductor ‘r’ meter.

Unit No.-V: Capacitance of Transmission Line

Pre-requisites:- Understanding of capacitance of Transmission line, concept of GMR and GMD

Objectives:- To understand capacitance of three phase transmission line with symeetrical and unsymmetrical spacing

Outcomes: - After successfully completing this unit students will be able to interpret calculation of capacitance for different configurations of transmission line in power system.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Electric potential at single charged conductor, potential at conductor in a group of charged conductors	Chalk and talk	T3 and T2
2	Capacitance of single phase line with effect of earth's surface on electric field	chalk and talk	T3 and T2
3	Concept of G.M.R. and G.M.D for capacitance calculations	chalk and talk	T3 and T2
4	capacitance of three phase line with symmetrical and unsymmetrical spacing	Chalk and talk	T3 and T2
5	Capacitance of double circuit three phase line with symmetrical and unsymmetrical spacing.	Chalk and talk	T3 and T2
6	Numericals	Chalk and talk	T3 and T2

Question Bank: Theory

1. A transmission line has 2 parallel conductors 5m apart, radius of each conductor being 1.5cm Calculate capacitance of transmission line/Km.
2. Find the capacitance of a single phase transmission line between conductors and phase D neutral of 10 Km long consisting of two parallel wires of 2 cm in diameter and 4 m apart. Determine capacitance of same transmission line taking into account effect of ground between conductor and phase and neutral. The height of conductors above ground is 6m.
3. What is Ferranti effect? Deduce simple equation of voltage rise of unloaded line. Draw necessary phasor diagram.
4. What is the effect of load power factor on regulation and efficiency of Transmission line?
5. Derive the expression for capacitance of 3Φ transmission line when conductors are unsymmetrically spaced but transposed.

Unit No.-VI: Performance of transmission line

Pre-requisites:- Basic knowledge of Transmission line

Objectives: - Estimation of generalized circuit constant for short medium and long transmission line

Outcomes: - After successfully completing this unit students will be able to analyze the performance of transmission line and can estimate performance parameter.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Classification of lines based on length and voltage levels such as short, medium and long lines.	T1,T2,T3	PPT
2	Performance of short transmission line with voltage current relationship and phasor diagram,	T1,T2,T3	PPT
3	Representation of medium lines as 'Nominal Pi' and 'Nominal Tee' circuits using R, L and C parameters.	T1,T2,T3	PPT
4	Ferranti effect, Representation of 'Tee' and 'Pi' models of lines as two port networks	T1,T2,T3	PPT
5	Evaluation and estimation of generalized circuit constants (ABCD) for short and medium lines,	T1,T2,T3	PPT
6	Estimation of Efficiency & regulation of short & medium lines.	T1,T2,T3	PPT

Question Bank: Theory

1. With neat diagram and phasor diagram derive the relationship between sending end and receiving end quantities of medium transmission line consisting T model of line.
2. With neat diagram derive expression for ABCD constants of transmission line Draw neat phasor diagram hence state properties of short transmission line.
3. A single phase overhead transmission line delivers 1100KW at 33 kV at 0.8 p.f lagging. The total resistance and inductive reactance of transmission line are 10Ω and 15 Ω. Determine
   a) Sending end voltage
   b) Sending end power
   c) Transmission efficiency
   d) Voltage regulation
4. Classify transmission line based on voltage ,length and line parameters of short medium and long transmission line
6. A single phase transmission line transmits 1000KW at 10KV at 0.8pf lagging .It has total loop resistance of 2 Ω and inductive reactance of 3Ω.Determine
   a) Voltage regulation
   b) Transmission efficiency

ELECTRICAL MACHINE-I

PROGRESSIVE EDUCATION SOCIETY'S

MODERN COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING

Name of the Subject – Electrical Machines I

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	04	-	02

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
50	50	50	-	25	175	

Unit 1

Transformers

Single phase Transformer: Concept of ideal transformer. Corrugated core transformer. Useful and leakage flux, its effects. Resistance, leakage reactance and leakage impedance of transformer windings & their effects on voltage regulation and efficiency. Exact and approximate equivalent circuits referred to L.V. and H. V. side of the transformer. Phasor diagrams for no-load and on load conditions. Transformer ratings. Losses in a transformer, their variation with load. Efficiency and condition for maximum efficiency. Open circuit and short circuit tests, determination of equivalent circuit parameters from the test data and determination of voltage regulation and efficiency. Autotransformers, their ratings and applications. Comparison with two winding transformer with respect to saving of copper and size.

[8 Hrs]

Unit 2

Transformers

Polarity test. Parallel operation of single phase transformers, conditions to be satisfied, load sharing under various conditions.

Three phase transformers: Standard connections of three phase transformers and their suitability for various applications, voltage phasor diagrams and vector groups.

Descriptive treatment of Parallel operation of three phase transformers Scott connection and V connections. Three winding (tertiary windings) transformers

[6 Hrs]

Unit 3

D.C. Machines

Construction, main parts, magnetic circuits, poles, yoke, field winding, armature core, Armature windings : Simple lap and wave winding, commutator and brush assembly. Generating action, e.m.f equation, magnetization curve, motoring action. Types of DC motors, significance of back e.m.f. torque equation, working at no-load and on-load. Losses, power flow diagram and efficiency. Descriptive treatment of armature reaction.

[8 Hrs]

Unit 4

Characteristics and applications of D.C. Shunt and Series Motors, Starting of DC motors, study of starters for series and shunt motor, solid state starters, speed control of various types of DC motors.

Commutation: Process of commutation, time of commutation, reactance voltage, straight line commutation, commutation with variable current density , under and over commutation, causes of bad commutation and remedies, inter poles, compensating windings. (Descriptive treatment only)

[8 Hrs]

Unit 5

Three phase induction motor

Production of rotating mmf by 3-phase balanced voltage fed to a symmetrical 3-phase winding. Construction : Stator and its 3-phase windings. Types of rotors: Squirrel cage & wound rotors. Principle of working, simplified theory with constant air gap flux; slip, frequency of rotor emf and rotor currents, mmf produced by rotor currents, its speed w.r.t. rotor and stator mmf. Production of torque, torque-slip relation, condition for maximum torque, torque-slip Characteristics, effect of rotor resistance on torque-slip characteristics. Relation between starting torque, full load torque and maximum torque.

Losses in three phase induction motor, power-flow diagram. Relation between rotor input power, rotor copper loss & gross mechanical power developed, efficiency.

[8 Hrs]

Unit 6

Induction motor as a generalized transformer; phasor diagram. Exact & approximate equivalent circuit. No load and blocked rotor tests to determine the equivalent circuit parameters and plotting the circle diagram. Computation of performance characteristics from the equivalent circuit and circle diagram. Performance curves.

Necessity of starter for 3-phase induction motors. Starters for slip-ring and cage rotor induction motors; stator resistance starter, auto transformer starter, star delta starter and rotor resistance starter. D.O.L. starter and soft starting, with their relevant torque and current relations. Comparison of various starters. , testing of three phase induction motor as per IS 325 & IS 4029.

[6 Hrs]

Industrial Visit:-

Minimum One visit to above machines manufacturing industry is recommended.

List of Experiments :

Note: First three experiments on transformer are compulsory, any two on D.C. machines and three on Induction motors. Report on industrial visit.

1. O.C. and S.C. test on single phase Transformer.
2. Polarity test on single phase and three phase transformer.
3. Parallel operation of two single phase transformers and study of their load sharing under various conditions of voltage ratios and leakage impedances.
4. Speed control of D.C. Shunt motor and study of starters
5. Brake test on D.C. Shunt motor
6. Load characteristics of D.C. series motor.
7. Hopkinson's test on D.C. shunts machines.
8. Load test on 3-phase induction motor.
9. No load & blocked-rotor test on 3-phase induction motor :
    a. Determination of parameters of equivalent circuit
    b. Plotting of circle diagram.
10. Calculation of motor performance from (a) & (b) above.

Text Books:

1. Electrical Technology by Edward Hughes ELBS, Pearson Education.
2. Electrical Machines by Ashfaq Husain, Dhanpat Rai & Sons
3. Electrical Machine 2nd Edition by S. K. Bhattacharya, Tata Mc Graw Hill publishing Co. Ltd.
4. Electrical Machines by Nagrath & Kothari, Tata Mc Graw Hill.
5. Electrical Machines by Bhag S Guru, Husein R. Hiziroglu, Oxford University Press.
6. Electrical Machines- I and II, by K Krishna Reddy, SCITECH Publications (India) Pvt. Ltd. Chennai.

Reference Books:

1. Performance and Design of Direct Current Machines Third Edition by A.E.Clayton and N.N. Hancock, CBS Publishers.
2. Electrical Machines Fifth Edition by A.E. Fitzgerald, Charles Kingsley, Stephen D. Umans Tata Mc Graw Hill Publication Ltd.
3. Theory and performance of DC machines by A.S. Langsdorf, Tata Mc Graw Hill.
4. Theory and Performance of AC machines by A.S. Langsdorf, Tata Mc Graw Hill.
5. Performance and Design of AC. Machines by M.G. Say CBS Publishers and Distributors.
6. Electrical Machines by Smarajit Ghosh , Pearson Education, New Delhi.
   Electrical Machines Theory, Application, & Control, Second Edition by Charles I Hubert, Pearson Education, New Delhi.

Course Objectives

- To understand construction and working of DC machines, transformers.
- To study various speed control methods of d. c. motors.
- To impart various applications of d. c. motors.
- To understand methods to determine regulation and efficiency of d. c. machines and transformers.

Course Outcomes

After successfully completing the course students will be able to:

1. Rrecognize and describe construction and working of single phase transformers.
2. Analyze working, controlling and applications of single and three phase transformers under different operating conditions.
3. Evaluate construction, performance parameters, working of d c machines.
4. Evaluate techniques of speed control and applications of d. c. machines under different operating conditions.
5. Analyze construction, working and operation three phase Induction motor.
6. Analyze working and operation and applications under different operating conditions of three phase Induction motor, plot and evaluate its performance parameters

PROGRESSIVE EDUCATION SOCIETY'S

MODERN COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING

Academic Activity Planner

Units	UNIT Test1 (10 marks)	UNIT Test2 (10marks)	MCQ Test1 (10 marks)	MCQ Test2 (10 marks)	END TERM TEST (30 MARKS)	Tutorial (Each 20marks)
I	✓					•
II		✓				•
III			✓			•
IV				✓		•
V					✓	•
VI					✓	•

PROGRESSIVE EDUCATION SOCIETY'S

MODERN COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING

Teaching Plan

Teaching plan as per University Syllabus

Sr.No.	Unit	Broad Topics to be Covered	Total Lecture Planned
1	I	**Transformers**	08
2	II	**Transformers**	06
3	III	**D.C. Machines**	08
4	IV	**D.C. Machines**	08
5	V	**Three phase induction motor**	08
6	VI	**Three phase induction motor**	06

Unit wise Lecture Plan

Unit No.-I: Transformers

Pre-requisites:-

- Basic working principle of transformer, laws of Electromagnetic induction

Objective :-

- To understand construction and working of transformer.

Outcome :

- Students will recognize and describe construction and working of transformer.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Single phase Transformer: Concept of ideal transformer. Corrugated core transformer. Useful and leakage flux, its effects.	**T2,T3,R6,R5**	**Chalk & Talk**
2	Resistance, leakage reactance and leakage impedance of transformer windings & their effects on voltage regulation and efficiency	**T2,T3,R6,R5**	**Chalk & Talk**
3	Exact and approximate equivalent circuits referred to L.V. and H. V. side of the transformer	**T2,T4,R6,R5**	**PPT**
4	Pharos diagrams for no-load and on load conditions. Transformer ratings.	**T2,T3,R6,R5**	**PPT**
5	Losses in a transformer, their variation with load. Efficiency and condition for maximum efficiency	**T2,T4,R6,R5**	**Chalk & Talk**
6	Open circuit and short circuit tests, determination of equivalent circuit parameters from the test	**T2,T4,R6,R5**	**PPT**
7	Determination of voltage regulation and efficiency. Autotransformers, their ratings and applications	**T2,T3,R6,R5**	**Chalk & Talk**
8	Comparison with two winding transformer with respect to saving of copper and size.	**T2,T4,R6,R5**	**Chalk & Talk**
9	Rubrics		

Question Bank: Theory

1. Explain the Construction, in detail, of 1-phase transformer with neat diagram
2. Differentiate between core and shell type transformer
3. Why transformer is rated in KVA not in KW?
4. Drive the induced EMF equation of a transformer. What is Voltage Regulation?
5. Draw the Exact phasor diagram of Transformer on full load
6. What are the various losses in the transformer?
7. Write the characteristics of an ideal transformer
8. Compare bank of 3 single phase transformer with a single 3 phase transformer.
9. Explain the two tests used for determining the losses in single phase transformer (Discuss the tests to find out the iron loss and copper loss in a transformer with justifications
10. Develop equivalent circuit of a 1-phase transformer. Draw the phasor diagrams for no-load and load conditions

Unit No.-II: Transformers

Pre-requisites:-

- Construction and working of transformer.

Objectives:-

- To understand various methods to determine regulation and efficiency of transformer

Outcomes:- After successfully completing this unit students will be able to analyze working, controlling and applications of transformer, Autotransformer.

Lecture No.	Details of the Topic to be covered	References	Mode of delivery
1	Polarity test. Parallel operation of single phase transformers	**T2,T3,R6,R5**	**Chalk & Talk**
2	conditions to be satisfied, load sharing under various conditions.	**T4,T3,R6,R5**	**Chalk & Talk**
3	Standard connections of three phase transformers and their suitability for various applications	**T2,T4,R6,R5**	**PPT**
4	Voltage phasor diagrams and vector groups.	**T2,T3,R6,R5**	**PPT**
5	Descriptive treatment of Parallel operation of three phase transformers Scott connection and V connections.	**T3,T4,R6,R5**	**Chalk & Talk**
6	Three winding (tertiary windings) transformers	**T2,T4,R6,R5**	**PPT**
7	Rubrics		

Question Bank: Theory

1. Describe an auto transformer including its points such as definition, comparison with two winding transformer, saving of copper and its applications. Write advantages and applications of auto transformer.
2. Discuss open delta connections of transformers with necessary circuit and vector diagrams. And its advantages.
3. Explain the conditions of parallel operation of three phase transformers. How three phases to two phase transformation of transformer is obtained?
4. Define Transformation Ratio.
5. In no load test of single phase transformer, the following test data were obtained:
   Primary voltage: 220V; Secondary voltage: 110V; Primary current: 0.5A; Power input:
   30W. Find the following: (i) The turns ratio (ii) The magnetizing component of no-load current (iii) It's working (or loss) component (iv) The iron loss Resistance of primary winding = 0.6Ω.
6. Obtain the equivalent circuit of a 200/400 V ,50 Hz,1 Phase Transformer from the following test data O.C. Test : 200 V,0.7 A,70 W - on L.V. side S.C. Test : 15 V, 10 A, 85 W -on H.V. side Calculate the secondary voltage when delivering 5 KW at 0.8 p. f. lagging , the primary voltage being 200V
7. A 100 KVA, 50 Hz, 440/11000 V, 1- phase transformer has an efficiency of 98.5% when supplying full-load current at 0.8 power factor lagging and an efficiency of 99% when supplying half full load current at unity power factor. Find the core losses and the copper losses corresponding to full-load current. At what value of load current will the maximum efficiency be attained?

Unit No.-III: D.C. Machines

Pre-requisites :-

- Flemings left hand/right hand rule
- Laws of electromagnetic induction

Objectives :-

- To understand construction and working of DC machines
- To understand concept of armature reaction

Outcomes: - After successfully completing this unit students will be able to:

- Evaluate different losses occurred in DC machines & its efficiency.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Construction, main parts, magnetic circuits, poles, yoke, field winding, armature core	T4,T2,T3,R6,R1	Chalk & Talk
2	Armature windings : Simple lap and wave winding, commutator and brush assembly	T2,T4,T3,R6,R5	Chalk & Talk
3	Generating action, e.m.f equation	T2,T4,R6,R5	PPT
4	Magnetization curve, motoring action. Types of DC motors	T2,T3,R6,R1	PPT
5	significance of back e.m.f. torque equation	T3,T4,R6,R5	Chalk & Talk
6	working at no-load and on-load., Losses	T2,T4,R6,R1	PPT
7	Power flow diagram and efficiency.	T4,T3,R6,R5	Chalk & Talk
8	Descriptive treatment of armature reaction.	T2,T4,R6,R1	Chalk & Talk
9	Rubrics		

Question Bank: Theory

1. Explain following characteristic of separately excited d.c. generator .(i) No-load saturation characteristic (ii) Internal and External characteristic
2. Explain in brief various methods of speed control of d.c. shunt motors.
3. What is commutation? Give remedies for commutation.
4. Explain various types of losses occurring in a d.c. generator.
5. Explain in brief various methods of speed control of d.c. shunt motors.
6. Explain various types of losses occurring in a d.c. generator.
7. Explain the term 'Back emf' in respect to d.c.motor.
8. Explain following characteristic of separately excited d.c. generator .(i) No-load saturation characteristic (ii) Internal and External characteristic

Unit No.-IV: D.C. Machines

Pre-requisites:-

- Basic working principle of machines and its rotating theory

Objectives:-

- To study various speed control methods of DC motors.
- To study different types of starters for DC motors
- To impart various applications of DC motors.

Outcomes:- After successfully completing this unit students will be able to:

- evaluate performance parameters, working and applications of DC motor.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Characteristics and applications of D.C. Shunt and Series Motors	**T4,T2,T3,R6,R5**	**Chalk & Talk**
2	Starting of DC motors, study of starters for series and shunt motor	**T2,T4,T3,R6,R5**	**Chalk & Talk**
3	solid state starters, speed control of various types of DC motors.	**T3,T2,T4,R6,R5**	**PPT**
4	Process of commutation, time of commutation, reactance voltage	**T2,T3,R6,R5**	**PPT**
5	straight line commutation, commutation with variable current density , under and over commutation	**T3,T4,R6,R5**	**Chalk & Talk**
6	causes of bad commutation and remedies, inter poles	**T2,T4,R6,R5**	**PPT**
7	compensating windings	**T4,T3,R6,R5**	**Chalk & Talk**
9	Rubrics		

Question Bank: Theory

1. Describe different parts of a d.c. machine; their material and functions with the help of a neat diagram.(Draw schematic diagram of a dc machine with labels. State the functions of (i) pole shoe, (ii) commutator and (iii) yoke.)
2. Explain the phenomenon of armature reaction in a d.c. machine.
3. Explain different methods to neutralize the effect of armature reaction.
4. Differentiate between self-excited and separately excited d.c. machines. Draw the load characteristic of dc shunt and series generator.
5. Draw the load characteristics of shunt, series and compound generators.
6. Discuss load characteristics (current-torque) of d.c. shunt, series, and compound motors. Also state their applications.
7. Explain working principle of d.c. motor. Derive the condition for maximum Power
8. What is commutation? Give remedies for commutation.

Unit No.-V: Three phase induction motor

Pre-requisites:-

- Basic working principle of machines and its rotating theory
- Laws of electromagnetic induction

Objectives:-

- To understand construction and working of induction motor.
- To understand relation between different power stages of induction motor.

Outcomes: - After successfully completing this unit students will be able to:

- evaluate different losses occurred in Induction motor & its efficiency.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Production of rotating mmf by 3-phase balanced voltage fed to a symmetrical 3-phase winding. Construction: Stator and its 3-phase windings.	T4,T3,R1,R5	Chalk & Talk
2	Types of rotors: Squirrel cage & wound rotors. Principle of working, simplified theory with constant air gap flux	T4,T3,R1,R5	Chalk & Talk
3	slip, frequency of rotor emf and rotor currents, mmf produced by rotor currents, its speed w.r.t. rotor and stator mmf.	T3,T4,R1,R5	PPT
4	Production of torque, torque-slip relation, condition for maximum torque, torque-slip Characteristics, effect of rotor resistance on torque-slip characteristics.	T4,T3,R1,R5	PPT
5	Relation between starting torque, full load torque and maximum torque.	T3,T4,R1,R5	Chalk & Talk
6	Losses in three phase induction motor, power-flow diagram.	T2,T4,R1,R5	PPT
7	Relation between rotor input power, rotor copper loss & gross mechanical power developed, efficiency	T4,T3,R1,R5	Chalk & Talk
9	Rubrics		

Question Bank: Theory

1. Show the power development stages in an three phase induction motor.
2. Draw the equivalent circuit of an three phase induction motor.
3. What is an induction generator?
4. Sketch and explain the torque slip characteristics of a 3-phase cage and slip ring induction motors. Show the stable region in the graph.
5. Give Relation between starting torque, full load torque and maximum torque.
6. State and explain different losses occurred in induction motor.
7. With the help of diagrams, explain how a rotating magnetic field is produced in the air gap of a 3-phase induction motor.
8. List the differences between squirrel cage and slip ring rotor.
9. Define slip of induction motor.
10. A 3-phase induction motor does not run at synchronous speed. Why?
11. Why is the no-load current drawn by 3-phase induction motor so high?

Unit No.-VI: Three phase induction motor

Pre-requisites:-

- Basic working principle of machines and its rotating theory

Objectives:-

- To study different types of starters for induction motor.
- To impart various applications of induction motor.

Outcomes: - After successfully completing this unit students will be able to:

- evaluate performance parameters, working and applications of induction motor.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Induction motor as a generalized transformer; phasor diagram.	T4,T3,R1,R6	Chalk & Talk
2	Exact & approximate equivalent circuit. No load and blocked rotor tests to determine the equivalent circuit parameters	T4,T3,R1,R6	Chalk & Talk
3	plotting the circle diagram	T3,T4,R1,R6	PPT
4	Computation of performance characteristics from the equivalent circuit and circle diagram. Performance curves.	T4,T3,R1,R6	PPT
5	Necessity of starter for 3-phase induction motors. Starters for slip-ring and cage rotor induction motors;	T3,T4,R1,R6	Chalk & Talk
6	stator resistance starter, auto transformer starter, star delta starter	T2,T4,R1,R6	PPT
7	Rotor resistance starter. D.O.L. starter and soft starting, with their relevant torque and current relations.	T4,T3,R1,R6	Chalk & Talk
8	Comparison of various starters. , testing of three phase induction motor as per IS 325 & IS 4029.	T4,T3,R1,R6	Chalk & Talk
9	Rubrics		

Question Bank: Theory

1. Discuss the equivalent circuit of 3-phase induction motor
2. How is the circle diagram useful for estimating the working conductions of an induction motor?
3. From an equivalent circuit, derive the various power equation of an induction motor.
4. Explain the tests required to be performed to obtain the data for the circle diagram.
5. Draw and explain in detail DOL starter.
6. Explain-Induction motor as a generalized transformer.
7. Explain the effect of slip on the following rotor parameters.
    a. frequency ii) induced emf
    b. current iv) power factor v)reactance
8. Draw the diagram of an auto-transformer starter used for 3-phase induction motor and explain its operation

Practical Assessment

List of Experiments

Sr. No.	Name of the Practical
1	O.C. and S. C. Test on single phase transformer
2	Polarity test on single phase transformer
3	Parallel operation of two single phase transformer
4	speed control of DC shunt motor by armature and field control method
5	Brake load test on DC shunt motor
6	Load test on 3 phase Induction motor
7	No load and blocked rotor test on Three phase Induction Motor
8	Speed control of 3 phase slip ring induction motor by varying external resistance in its rotor circuit.
9	Performance of an induction motor through circle diagram

NETWORK ANALYSIS

203147: NETWORK ANALYSIS

Weekly Work Load (in Hrs.)	Lecture	Tutorial	Practical
	04	02	02

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
50	50		-	50	150	

Syllabus:

Unit 01 : Basics of Network: (8 Hrs)

Source transformation: voltage and current sources, mesh analysis, nodal analysis, Concept of super node and super mesh, coupled circuits and dot conventions. Concept of network graphs (incidence, tie set and cut set matrix), Concept of duality and dual networks.

Unit 02 : Network Theorems: (8 Hrs)

Superposition, Thevenin, Norton, Maximum Power Transfer Theorem, Reciprocity theorem, Millman theorems applied to both ac/dc circuits.

Unit 03 : Analysis of Transient Response in Circuits-Classical Method: (8 Hrs)

Initial and Final Conditions of network, General and Particular Solutions, time constant. transient response of R-L, R-C and R-L-C networks in time domain.

Unit 04 : Analysis of Transient Response in Circuits: Laplace Transform Approach: (8 Hrs)

Standard test inputs: Step, Ramp, Impulse, Their Laplace transform, Representation of R,L,C in S domain, transformed network, Application of Laplace transform to solve series and parallel R-L, R-C and R-L-C circuits (Source free, Source driven).

Unit 05 : Two Port Network and Network Functions: (8 Hrs)

Two port parameters: Z, Y, H and Transmission parameters Network Functions for 1 and 2 port, calculation of network functions, Poles and zeros of network functions, Restrictions on poles and zeros, Time–domain behavior from the pole and zero location, Necessary conditions for stable driving point function and Transfer function.

Unit 06: Filters: (8 Hrs)

Classification of filters: Low pass, High Pass, Band pass, Band stop, Symmetrical networks : characteristic impedance , propagation constant, Design of constant K- low pass and constant K- high pass filters using symmetrical networks.

Text Books:

[T1] M. E. Van Valkenburg, "Network Analysis", Prentice Hall of India Private Limited, Third Edition,
[T2] D Roy Choudhary, "Network and Systems", New age international publishers.
[T3] AbhijitChakroborty, "Circuit Theory", DhanpatRai and Company, 7th edition.
[T4] Ravish R Singh, "Network Analysis and synthesis", McGraw Hill education (India) Pvt. Ltd, 3rd edition 2015.

Reference Books:

[R1] William H. Hayt, Jr. Jack E. Kemmerly, "Engineering Circuit Analysis" McGraw Hill Publication.
[R2] N.C. Jagan, "Network Analysis", BS Publication, Hyderabad, Second Edition.
[R3] G. K. Mittal, "Network Analysis and Synthesis", Khanna Publication.

Reference Web Links/ Research Paper/ Referred Book other than Mention in Syllabus:

1.www.nptel.ac.in

2.www.electrical4you.com

3. www.electronicspani.com

Course Objectives:

- To develop the strong foundation for Electrical Networks.
- To develop analytical qualities in Electrical circuits by application of various theorems.
- To understand the behavior of circuits by analyzing the transient response using classical methods and Laplace Transform approach.
- To apply knowledge of Network theory for analysis of 2-port networks and design of other circuits like filters.

Course Outcomes:

CO1: Students will be able to classify types of networks and formulate network equations for loop and nodal analysis.

CO2: Students will be able to define and implement network theorems to solve various circuits.

CO3: Students will be able to analyse transient response of basic circuits using classical method.

CO4: Students will be able to analyse transient response of basic circuits using Laplace transform method.

CO5: Students will be able to describe and synthesize two-port network, network functions and identify stability of networks.

CO6: Students will be able to define, recognize and design passive filters.

Academic Activity Planner: NA-AY-2018-19-Term-II

Units	MCQ TEST (10marks/ unit)	Assignment (Each 5 marks)	End Tem Test (30marks)
1	√	√	
2	√	√	
3	√	√	
4	√	√	
5		√	√
6		√	√
Workshop on Virtual Lab.			

Teaching Plan

Teaching plan as per University Syllabus:

Sr.No.	Unit	Broad Topics to be Covered	Total Lecture Planned
1	I	Basics of Network	08
2	II	Network Theorems	08
3	III	Analysis of Transient Response in Circuits-Classical Method	08
4	IV	Analysis of Transient Response in Circuits: Laplace Transform Approach	08
5	V	Two Port Network and Network Functions	08
6	VI	Filters	08

Unit wise Lecture Plan

Unit No.-I: Basics of Network

Pre-requisites:

- Terminology of electrical networks

Objectives:

- To develop the strong foundation for Electrical Networks

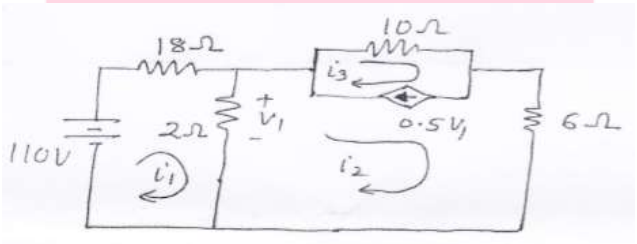
Outcomes:

- Students will be able to classify types of networks and formulate network equations for loop and nodal analysis.

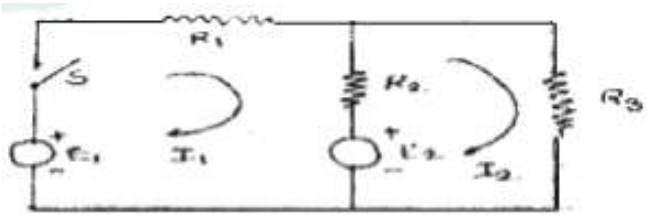
Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Prerequisite and Syllabus Introduction	Syllabus	Communication
2	Source transformation: voltage and current sources	T1,T2,T3,T4 R1,R3	Chalk and Talk
3	Concept of Mesh Analysis	T1,T2,T3,T4	Chalk and Talk
4	Concept of Nodal Analysis	T1,T2,T3,T4	Chalk and Talk
5	Concept of Super Node, Super Mesh	T1,T2,T3,T4	Chalk and Talk
6	Mutual Inductance Coupled Circuits and Dot	T1,T2,T3,T4	Chalk and Talk
7	Concept of network graphs (incidence, tie set and cut	T1,T2,T3,T4	Chalk and Talk
8	Concept of Duality And Dual Networks.	T1,T2,T3,T4	Chalk and Talk

Question Bank: Theory- Unit: I

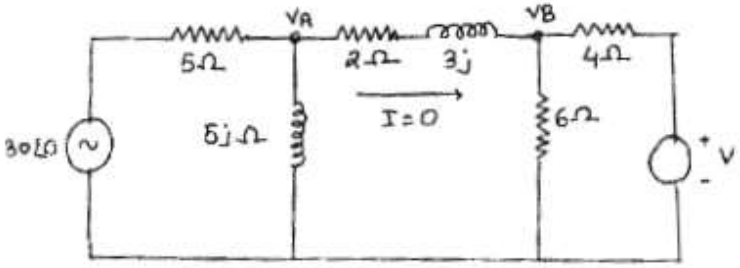
1) Explain
    1. Dependent and independent sources
    2. Active and passive networks
    3. Unilateral and Bilateral networks
    4. Lumped and distributed networks
    5. Linear and Nonlinear networks
2) Explain: On what basis you select nodal analysis or mesh analysis for solving any given network
3) Explain: The concept of super mesh and super node with example.
4) Define: Mutual inductance and explain dot convention with neat circuit diagram.
5) Explain principle of duality with suitable example.
6) What are coupled circuits?
7) What are coupled coils?
8) Define self-inductance and mutual inductance.
9) Define coefficient of coupling.
10) State dot convention for coupled coils.
11) Define:
    1. Graph
    2. Tree
    3. Node
    4. Link
    5. Twig
12) Explain the following:
    1. Incidence Matrix
    2. Tie-set Matrix
    3. Cut-set matrix
13) Find current through 10Ω resistance using mesh analysis.



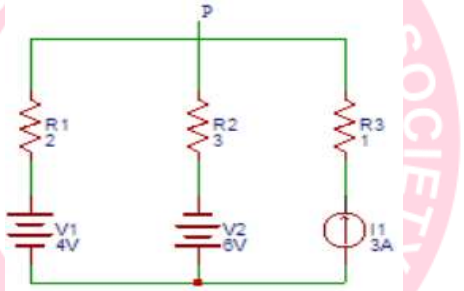
14) By using graphical method, find dual of the given network:



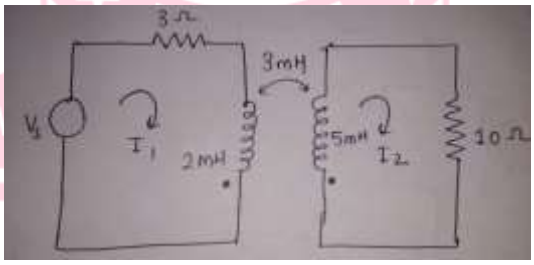
15) For the network shown in figure, determine voltage 'V' which results in zero current through (2+3j) Ω impedance.



16) Find the voltage at node P in the figure shown



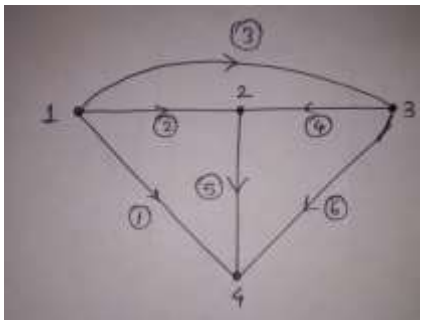
17) Solve the circuit shown below for I_2 where, V_S=100 V and ω= 5000 rad/s



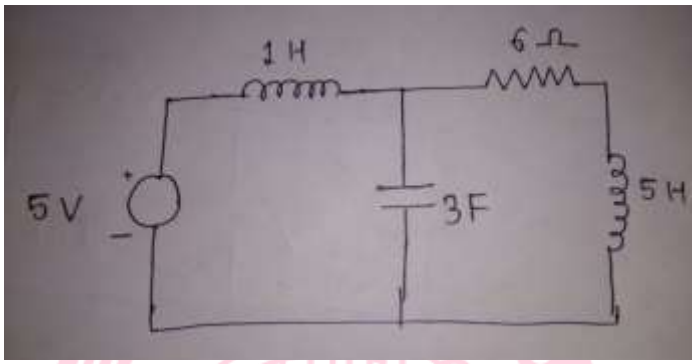
18) The Incidence matrix of a certain network graph is given. Calculate the number of possible trees

$$Ai = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & -1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & -1 & -1 & -1 \\ 0 & 0 & 0 & 1 & 0 & 0 & -1 & 0 \end{bmatrix}$$

19) For the following network graph find out corresponding incident, tie-set and cut-set matrix.



20) Draw dual network of the following network



Unit No.-II: Network Theorems

Pre-requisites:

- Terminology of electrical networks

Objectives:

- To develop analytical qualities in Electrical circuits by application of various theorems

Outcomes: After successfully completing this unit,

- Students will be able to define and implement network theorems to solve various circuits.

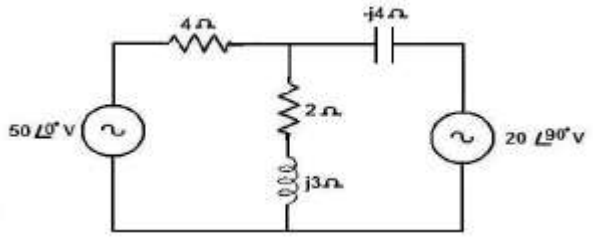
Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Perquisite and Introduction	T2,T3,T4 R1,R3	Chalk and Talk
2	Superposition Theorem applied to both ac/dc circuits.	T2,T3,T4 R1,R3	Chalk and Talk
3	Thevenin's Theorem applied to both ac/dc circuits.	T2,T3,T4 R1,R3	Chalk and Talk
4	Norton Theorem applied to both ac/dc circuits.	T2,T3,T4 R1,R3	Chalk and Talk
5	Maximum Power Transfer Theorem applied to both ac/dc circuits.	T2,T3,T4 R1,R3	Chalk and Talk
6	Millman's theorem applied to both ac/dc circuits.	T2,T3,T4 R1,R3	Chalk and Talk
7	Reciprocity theorem applied to both ac/dc circuits.	T2,T3,T4 R1,R3	Chalk and Talk
8	Additional problems related to above topic	T2,T3,T4 R1,R3	Chalk and Talk

Question Bank: Theory: Unit 2:

1) State and explain following theorem along with its limitation:

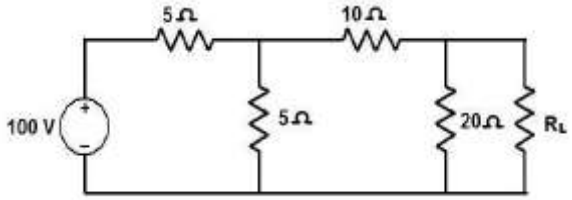
1. Superposition Theorem,
2. Thevenin's Theorem,
3. Norton Theorem,
4. Maximum Power Transfer Theorem,
5. Reciprocity Theorem,
6. Millman Theorem

2) (a) For the circuit shown, determine the current in (2+j3) ohm by using superposition theorem.



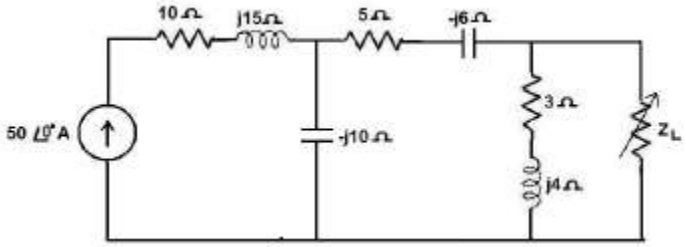
(b) State and prove Norton's theorem.

3) (a) Find the value of R_L so that maximum power is delivered to the load resistance shown in figure

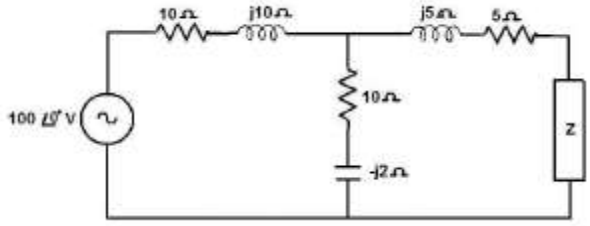


(b) State and explain reciprocity theorem.

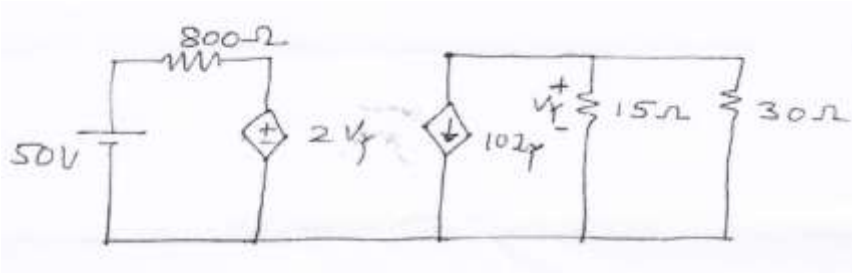
4) Determine the maximum power delivered to the load in the circuit.



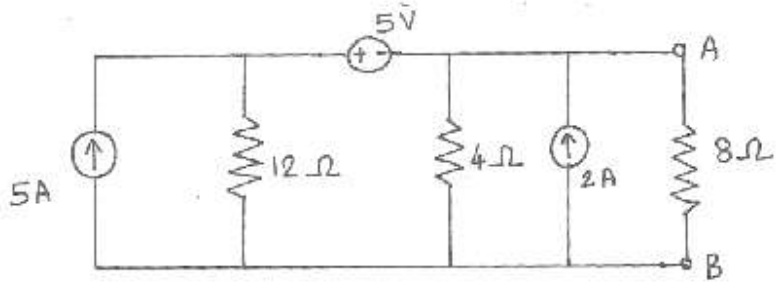
5) Find the value of impedance Z so that maximum power will be transferred from source to load for the circuit shown



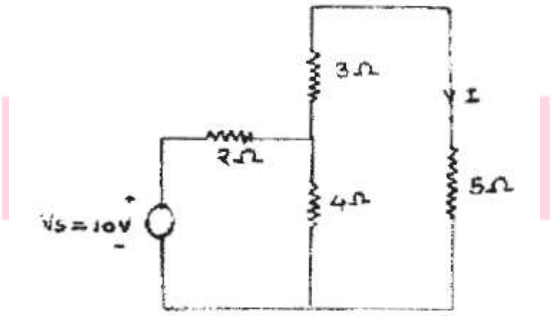
6) Find current through 30Ω resistance by using Thvenins Theorems as shown in fig:



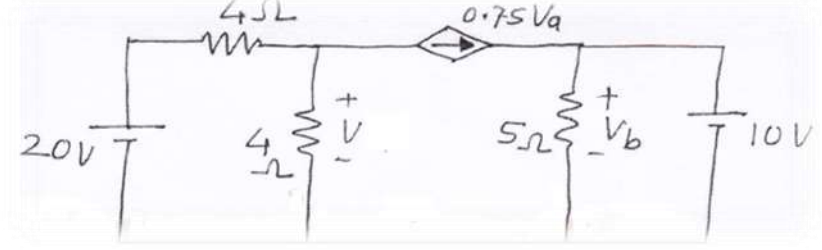
7) Find current through 8Ω resistance by Norton's theorem.



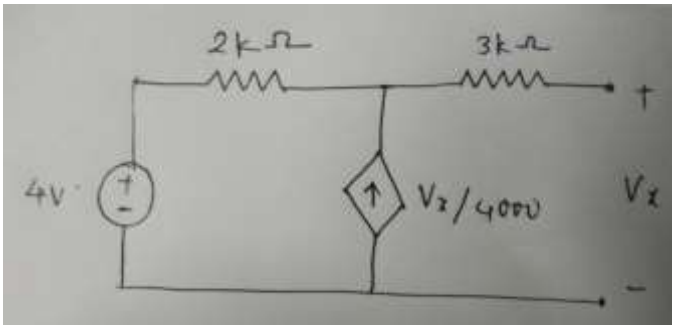
8) Verify Reciprocity Theorem for voltage and current shown in the figure:



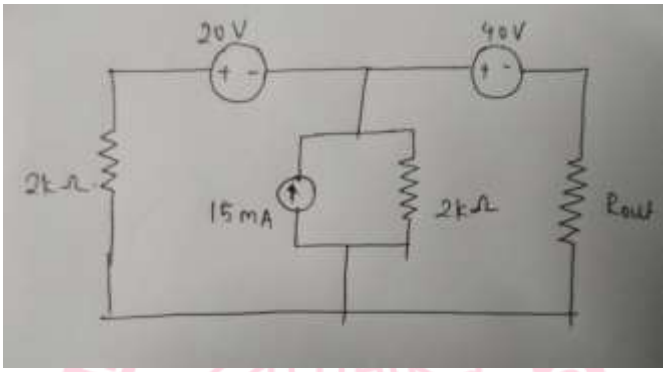
9) Find V_a and V_b using Superposition Theorem:



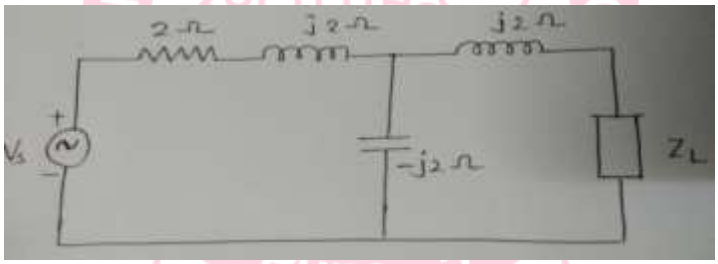
10) Find Thevenin's equivalent of the circuit given below:



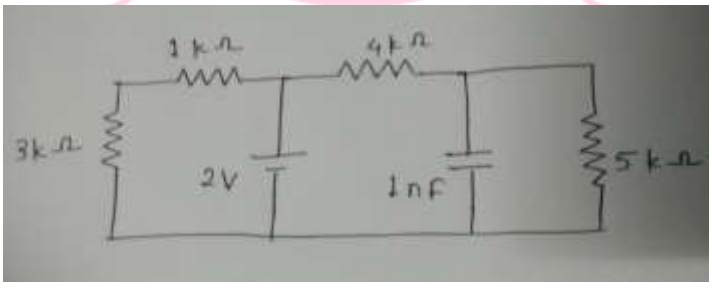
11) Find the power delivered by 40 V source:



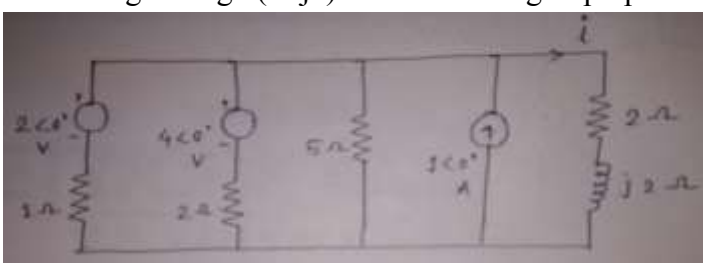
12) Find Z_L such that maximum power is transferred to it



13) Find Norton's equivalent of following circuit with respect to the capacitor of 1 nF:



14) Calculate the current flowing through (2+j2) Ω branch using Superposition theorem:



Unit No.-III: Analysis of Transient Response in Circuits-Classical Method

Pre-requisites:

- Differential calculus, linear differential equations,

Objectives:

- To understand the behavior of circuits by analyzing the transient response using Classical methods approach.

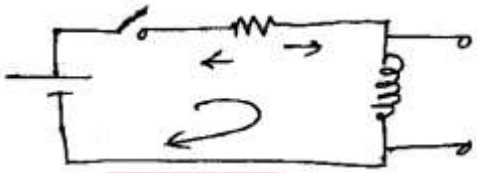
Outcomes: After successfully completing this unit

- Students will be able to analyse transient response of basic circuits using classical method.

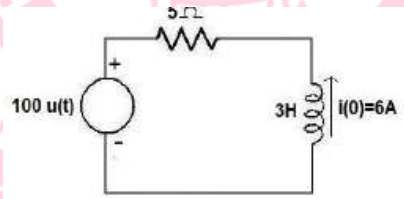
Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Initial And Final Condition of Network, Time Constant.	T1,T3 R2,R3	PPT, Chalk and Talk
2	General and Particular Solution,	T1,T3 R2,R3	Chalk and Talk
3	Transient Response of R-L Network In Time Domain.	T1,T3 R2,R3	PPT, Chalk and Talk
4	Additional Problems Related to above Topic	T1,T3 R2,R3	Chalk and Talk
5	Transient Response of R-C Network In Time Domain.	T1,T3 R2,R3	Chalk and Talk
6	Additional Problems Related to Above Topic	T1,T3 R2,R3	Chalk and Talk
7	Transient Response of R-L-C Network in Time Domain.	T1,T3 R2,R3	Chalk and Talk
8	Additional Problems Related to above Topic	T1,T3 R2,R3	Chalk and Talk

Question Bank: Theory Unit No.-III

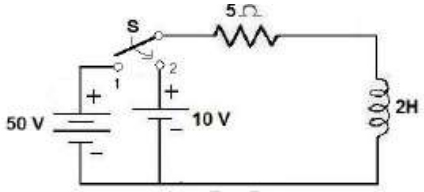
1) Write a short note on initial and final conditions in the network.
2) Obtain the expression for capacitor voltage in a RC series circuit connected to a d.c. voltage V for $t > 0$. Assume initial charge across capacitor as zero. Also sketch the response graph for the current through capacitor and from the graph define time constant of the circuit.
3) For the network shown in Fig. 7, find the expression for current $i(t)$ when the switch is closed at $t = 0$ by using classical method. Also obtain the expression for VR(t) and VL(t). Assume initial current in the inductance is zero.



4) Make a table for transient response of RL and RC(driven and un-driven circuit) and all responses of RLC series and RLC parallel circuit.
5) What is critical resistance?
6) What is natural and damped frequency?
7) What is an initial condition?
8) What is the steady state value?
9) What are critical frequencies? Why they are so called?
10) Distinguish between steady state and transient response.
11) In the circuit of the figure shown below, find the expression for the transient currentand the initial rate of growth of the transient current

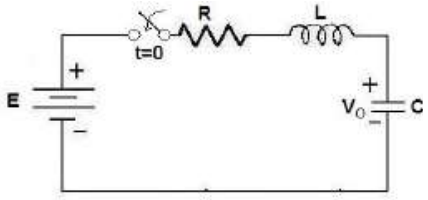


12) In the circuit shown in figure, switch S is in position 1 for a long time and brought to position 2 at time t=0. Determine the circuit current.

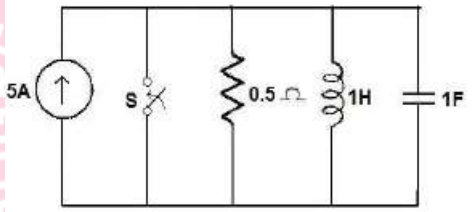


13) A resistance R and 2 microfarad capacitor are connected in series across a 200Vdirect supply. Across the capacitor is a neon lamp that strikes at 120V. Calculate to make the lamp strike 5 sec after the switch has been closed. If R = 5Megohm,how long will it take the lamp to strike?
14) A Series RLC circuits has R=50 ohm, L= 0.2H, and C = 50 microfarad. Constantvoltage of 100V is impressed upon the circuit at t=0. Find the expression for thetransient current assuming initially relaxed conditions.

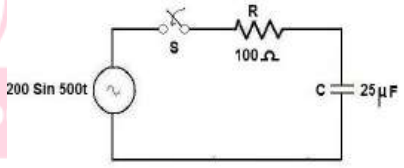
15) A Series RLC circuits with R=300 ohm, L=1H and C=100x10-6F has a constantVoltage of 50V applied to it at t= 0. Find the maximum value of current (Assumezero initial conditions6. For a source free RLC series circuit, the initial voltage across C is 10V and the initialcurrent through L is zero. If L = 20mH, C=0.5 microfarad and R=100 ohm. Evaluate i(t).
16) Derive an expression for current response of RLC series circuit transient.
17) Derive an expression for current response of RL and RC series circuit transients
18) A step voltage V(t) = 100 u(t) is applied to a series RLC circuit with L=10H, R=2ohmand C= 5F. The initial current in the circuit is zero but there is an initial voltage of50V on the capacitor in a direction which opposes the applied source. Find theexpression for the current in the circuit.



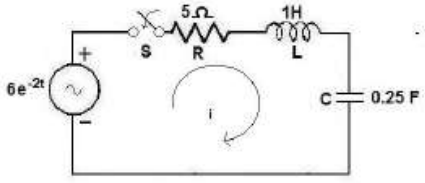
19) For the circuit shown in figure, find the voltage across the resistor 0.5 ohm when theswitch, S is opened at t=0. Assume that there is no charge on the capacitor and no current in the inductor before switching.



20) In the circuit shown in figure, find the current i. Assume that initial charge across the capacitor is zero



21) In the circuit shown in figure, the switch is closed at time t=0. Obtain i(t). Assumezero current through inductor L and zero charge across C before closing the switch.



Unit No.-IV: Analysis of Transient Response in Circuits: Laplace Transform Approach

Pre-requisites:

- Laplace transforms.

Objectives:

- To understand the behavior of circuits by analyzing the transient response using Laplace Transform approach.

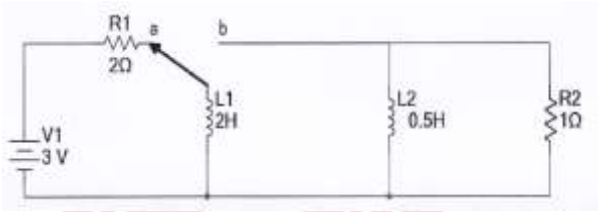
Outcomes: After successfully completing this unit students will be able to:

- Students will be able to analyse transient response of basic circuits using Laplace transform method

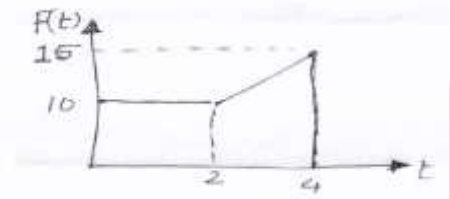
Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Basic Properties of Laplace Transform,	T2,T3 R1,R2	Chalk and Talk
2	Standard test inputs: Step, Ramp, Impulse, Their Laplace transform, transformed network,	T2,T3 R1,R2	Chalk and Talk
3	Representation of R,L,C in S domain,	T2,T3 R1,R2	Chalk and Talk
4	Application of Laplace transform to solve series and parallel R-L circuits	T2,T3 R1,R2	Chalk and Talk
5	Additional problems on Laplace transform of series and parallel R-L circuits	T2,T3 R1,R2	Chalk and Talk
6	Application of Laplace transform to solve series and parallel R-C circuits	T2,T3 R1,R2	Chalk and Talk
7	Additional problems on Laplace transform of series and parallel R-C circuits	T2,T3 R1,R2	Chalk and Talk
8	Application of Laplace transform to solve series and parallel R-L-C circuits	T2,T3 R1,R2	Chalk and Talk
9	Additional problems on Laplace transform of series and parallel R-L-C circuits	T2,T3 R1,R2	Chalk and Talk

Question Bank: Theory Unit No.-IV

1) State and explain properties of Laplace Transform.
2) Find the L.T. of the signal $f(t) = \sin \omega t\, u(t)$.
3) State and prove Initial Value Theorem and Final Value Theorem using Laplace transform
4) State and explain standard time signals and their Laplace transform.
5) What do you mean by lap-lace transform pair write its list?
6) State and prove convolution theorem using Laplace transform
7) What do you mean by Inverse Laplace transform.
8) The switch is changed from point a to point b at t= 0. Determine voltage across 4Ω resistance at t = 3sec. Using Laplace Transform.

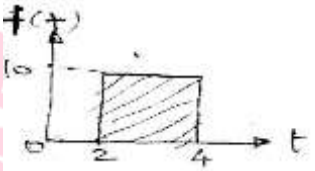


9) Find F(s) for the waveform shown in the figure:



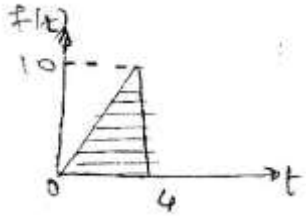
10) Find the Laplace transform of the function whose nature is as shown in figures.

a)



b)

c)



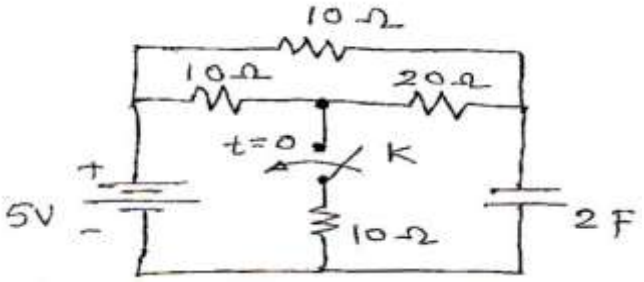
11) Find the inverse Laplace transform of :

a) $$F(s) = \frac{1}{s^3(s^{2-1})}$$

b) $$F(s) = \frac{s+1}{s^3 + 4s^2 + 4s}$$

12) State all the properties of Laplace transform.

13) In the circuit shown in fig 4b, determine Va(0–) and Va(0+) if switch K Is closed:



14) Discuss S-domain networks and their solution using Laplace transform.

15) What are the advantages of Laplace transform solution against classical method?

16) Explain the standard signals.

- Step function
- Ramp function
- Impulse functions

Also State their Laplace transforms.

Unit No.-V: Two Port Network and Network Functions

Pre-requisites:

- Basic Electrical Concepts networks.
- Definition and concept of Electrical circuit Element e.g. Impedance, admittance,

Objectives:

- To apply knowledge of Network theory for analysis of 2-port networks and design of other circuits like filters

Outcomes:

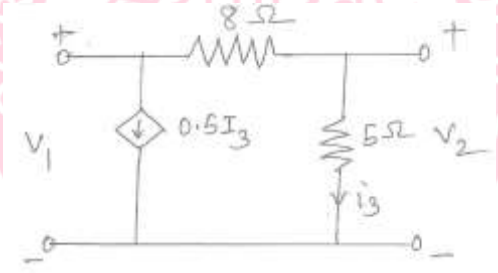
- Students will be able to describe and synthesize two-port network, network functions and identify stability of networks.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Two port parameters: Z, Y, H and Transmission parameters	T2,T3,T4,R3	Chalk and Talk
2	Problems related to above	T2,T3,T4,R3	Chalk and Talk
3	Network Functions for 1 and 2 port, calculation of network functions	T2,T3,T4,R3	Chalk and Talk
4	Poles and zeros of network functions	T2,T3,T4,R3	Chalk and Talk
5	Restrictions on poles and zeros	T2,T3,T4,R3	Chalk and Talk
6	Time–domain behavior from the pole and zero location.	T2,T3,T4,R3	Chalk and Talk
7	Necessary conditions for stable driving point function and Transfer function	T2,T3,T4,R3	Chalk and Talk
8	Additional problems on unit	T2,T3,T4,R3	Chalk and Talk

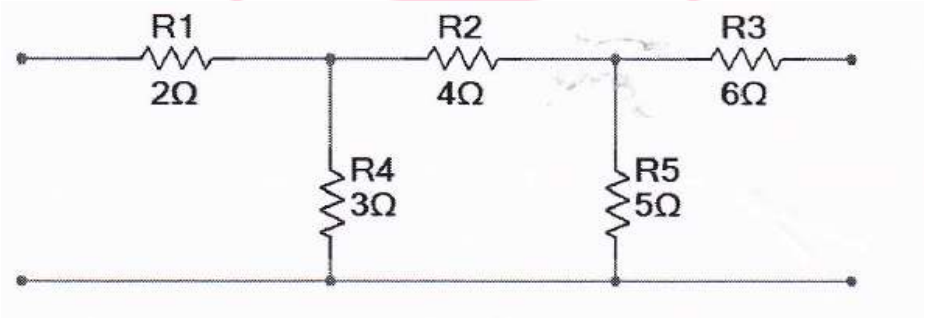
Question Bank: Theory

Unit No.-V

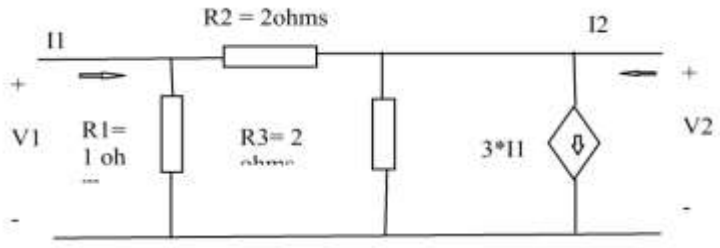
1) Explain the 2-port parameters :
   (i) *z*-parameters
   (ii) *Y*-Parameters
   (iii) *h*-parameters and inverse hybrid parameter.
   (iv) T-parameter and inverse transmission parameter
2) Derive the inter-relationship between all above parameters and make a table showing interrelations among all parameter.
3) Explain following connection of two port network parameter
   a) Series connection using Z-parameter
   b) Parallel connection using y-parameter
   c) Cascade connection using T-parameter
   d) Series parallel connection using hybrid parameter
4) Write a short note on insertion loss4. Write a short note on Problems in Optimizing power transfer.
5) A π network has been shown in fig. where ($0.5I_3$) is the controlled Current source. Obtain Z parameters for this π circuit model:



6) Find Z& H parameter of the circuit shown in fig:

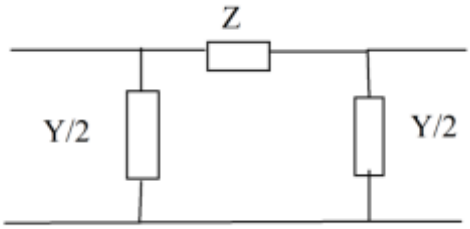


7) Find the y and z parameters of the following network:



8) A two port network is represented by equations
$V_1 = 24\ I_1 + 8\ I_2$
$V_2 = 8\ I_1 + 32\ I_2$
Find the equivalent network

9) Find ABCD parameters of the given network



10) For the impedance function $Z(s) = \frac{4s^2 + s^2 - 3s + 1}{s^3 + 2s^2 + 2s + 40}$, find the location of poles and zeros.

Unit No.-VI: Filters

Pre-requisites:

Basic Electrical Concepts of filters.

Objectives:

To apply the knowledge in passive filter design.

Outcomes: After successfully completing this unit,

- Students will be able to define, recognize and design passive filters.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction to filters	T2, T3, T4, R1	PPT
2	Classification of filters: Low pass, High Pass,	T2, T3, T4, R1	PPT
3	Classification of filters: Band pass, Band stop,	T2, T3, T4, R1	PPT
4	Symmetrical networks : characteristic impedance ,	T2, T3, T4, R1	PPT
5	Symmetrical networks : propagation constant,	T2, T3, T4, R1	PPT
6	Design of constant K- low pass filters using symmetrical networks.	T2, T3, T4, R1	PPT
7	Design of constant K- high pass filters using symmetrical networks.	T2, T3, T4, R1	PPT
8	Additional Problems	T2, T3, T4, R1	PPT

Question Bank: Theory

Unit No.-VI

1) What is filter? What are general uses of filters?
2) State the classification of filters.
3) State and explain general properties of Filters.
4) Define and explain:
   i. Characteristic Impedance
   ii. Propagation constant
5) Explain:
   i. Constant K filter
   ii. Constant K-Low Pass Filter
   iii. Constant K-High Pass Filter
6) Explain the following terms in relation with filter and give significance of each :
   i. Pass band
   ii. Stop band
   iii. Cut-off frequency
7) Explain High pass and low pass filter with circuit, characteristics and relation for cutoff frequency.
8) What is the difference between prototype filter and m derived filter.
9) Design a RLC band pass filter with a lower frequency of 1 kHZ and a bandwidth of 3 kHz.
10) In a simple section, a low pass filter has a design impedance R_0. Find $Z_{0\pi}$ at $0.9f_C$.
11) Design a constant K-low pass filter having cut-off frequency 2.5 kHz and design resistance R_0= 700 ohms. Also find the frequency at which this filter produces attenuation of 19.1 dB. Find its characteristic impedances and phase constant at pass band and stop or attenuation band.
12) Design a constant-k low pass filter, the T configuration with cutoff frequency 100 kHz and load 300 Ω
13) Design a constant-k high pass filter, the T configuration with cutoff frequency 100 kHz and load 300 Ω
14) Design a T and π section constant K-high pass filter having cut-off frequency of 12 kHz and nominal impedance R_0 = 500Ω. Also find:
   i. Its characteristic impedance and phase constant at 24 kHz
   ii. Attenuation at 4 kHz
15) Design a constant K-low pass filter having f_c=2 kHz and design impedance R_0 =600 Ω. Obtain the value of attenuation at 4 kHz

Practical Assessment

List of Experiments:

Any **four** experiments from the first five of the following and any **four** experiments from rest of the list. (Minimum four experiments should be based on simulation software PSPICE/MATLAB along with hardware verification)

Sr.No.	Name of the Practical
1	Verification of Superposition theorem in A.C. circuit.
2	Verification of Thevenin's theorem in A.C. circuits.
3	Verification of Reciprocity theorem in A.C. circuits.
4	Verification of Millmans' theorem
5	Verification of Maximum Power Transfer theorem in A.C. circuits
6	Determination of time response of R-C circuit to a step D.C. voltage input. (Charging and discharging of a capacitor through a resistor)
7	Determination of time response of R-L circuit to a step D.C. voltage input. (Rise and decay of current in an inductive circuit)
8	Determination of time response of R-L-C series circuit to a step D.C. voltage input.
9	Determination of parameter of Two Port Network
10	Frequency response of constant K- low pass filters
11	Frequency response of constant K- high pass filters.

NUMERICAL METHODS AND COMPUTER PROGRAMMING

Name of the Subject: Numerical Methods and Computer Programming

Weekly Work Load(in Hrs)	Lecture	Tutorial	Practical
	04	02	02

Online/ In-Sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
50	50	50	-	25	175	5

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Syllabus:

Unit 01 : Basics of C Language: (8 Hrs) Revision: Basics of 'C' language - Data types, Operators and its precedence. Control statements: 'if-else' and nested 'if-else', 'for, while and do-while'.
Arrays: Introduction, one and two dimensional arrays.
Functions: Types of functions User Defined Functions - declaration and prototypes, Local and Global variables.
Pointers: Introduction, declaring and initializing pointers.

Unit 02 : Numerical Methods, Errors and Concept of root of Equation: (8 Hrs)

A) Basic principle of numerical methods. Floating point algebra with normalized floating point technique, Significant digits.
Errors: Different types of errors, causes of occurrence and remedies to minimize them. Generalized error formula.
Concept of roots of an equation. Descartes' rule of signs, Sturm's theorem, Intermediate value theorem. Synthetic division, Roots of Polynomial Equations using Birge-Vieta method.

Unit 03 : Solution of Transcendental and polynomial equation and Curve Fitting: (8 Hrs)

A) **Solution of Transcendental and polynomial equation:** Bisection, Secant, Regula-Falsi, Chebyeshev and Newton-Raphson methods, Newton-Raphson method for two variables.
Curve Fitting using least square approximation – First order and second order.

Unit 04 : Interpolation and Numerical Differentiation: (8 Hrs)

A) **Interpolation:** Difference operators, Introduction to interpolation - Newton'sforward, backward interpolation formulae, Stirling's and Bessel's central difference formulae, Newton's divided difference formula, Lagrange's interpolation.

B) **Numerical Differentiation** using Newton's forward and backward interpolation formulae.

Unit 05 : Solution of Ordinary Differential Equation(ODE) and Numerical Integration: (8 Hrs)

A) Solution of First order Ordinary Differential Equation (ODE) using Taylor's series method, Euler's, Modified Euler's methods. Runge-Kutta second and fourth order methods. **Solution of Second order ODE** using 4th order Runge-Kutta method.

B) Numerical Integration: Trapezoidal and Simpson's rules as special cases of Newton-Cote's quadrature technique for single and double integrals.

Unit 06 : Solution of linear simultaneous equation: (8 Hrs)

A) **Solution of simultaneous equation:** Direct methods - Gauss and Gauss-Jordan elimination methods, concept of pivoting – partial and complete. Iterative methods – Jacobi and Gauss Seidel methods.

B) **Matrix Inversion** using Jordon method and Eigen values using Power method.

List of Experiments:

Term work shall consist of minimum **EIGHT** computer programs in C language with flowcharts and results.

1. Solution of a polynomial equation using Birge-Vieta method.
2. Solution of a transcendental equation using Bisection or Regula-Falsi method.
3. Solution of two variable non-linear equation using N-R method.
4. Program for interpolation using Newton's forward or backward interpolation.
5. Program for interpolation using Lagrange's or Newton's Divided difference interpolation.
6. First order curve fitting using Least square approximation.
7. Solution of simultaneous equation using Gauss Seidel or Jacobi method.
8. Solution of simultaneous equation using Gauss elimination or Jordon method.
9. To find largest Eigen value using Power method.
10. Solution of Numerical Integration using Simpson's (1/3) rd or (3/8) th rule.
11. Solution of first order ODE using 4th order RK method or Modified Euler method.

List of Tutorials:

***** Tutorials should be based on following method**

1. Minimum 6 'C' programs based on decision making, for, while, and do-while loops, one and two dimensional arrays and user defined functions.
2. Sturm's Theorem and Birge Vieta method.
3. Regula Falsi method, Newton Raphson method and Second order Least Square Approximation method.

4. Any two methods of interpolation with equal interval and all methods for unequal interval.
5. One direct and one iterative method for solution of linear simultaneous equations.
6. 4th order R-K method for first order ODE and 2nd order ODE and Simpson's rule for single and double integrals.

****** A Tutorial can be extended for more than one week to include all the mentioned methods.***

Text Books:

[T1] M. K. Jain, S.R.K. Iyangar, R. K. Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Publications.
[T2] T. Veerarajan and T. Ramchandran, "Numerical Methods with Programs in C and C++", Tata McGraw Hill Publication.
[T3] P.P. Gupta & G.S Malik, "Calculus of Finite Difference and Numerical Analysis", Krishna Prakashan Media Ltd, Meerut**.**
[T4] Dr. B. S. Grewal, "Numerical Methods in Engineering & Sciences", Khanna Publishers.
[T5] E. Balagurusamy, "Programming in ANSI C", Tata McGraw Hill Publication.
[T6] E. Balagurusamy, "Numerical Methods", Tata McGraw Hill Publication.

Reference Books:

[R1] J. B. Scarborough, "Numerical Mathematical Analysis", Oxford & IBH, New Delhi.
[R2] Steven Chapra, Raymond P. Canale, "Numerical Methods for Engineers", Tata McGraw Hill Publication.
[R3] Yashwant Kanetkar, "Let us C", BPB Publications.
[R4] S.S. Sastry, "Introductory methods of Numerical Analysis", PHI Learning Private Ltd.
[R5] P. Thangaraj, "Computer oriented Numerical Methods", PHI Learning Private Ltd.

Unit	Text Books	Reference Books
1	T5	R3
2	T6,T1,T3	R4,R2 ,R5
3	T2,T3,T4	R2 ,R1,R5
4	T2,T3,T4	R2,R1,R5
5	T2,T3,T4	R2,R1,R5
6	T2,T3,T4	R2,R1,R5

Reference Web Links/ Research Paper/ Referred Book other than Mention in Syllabus:

1. https://www.tutorialspoint.com
2. https://fresh2refresh.com

Course Objective:

- To emphasize the need of computational techniques and analyze errors involved in the computation.
- To provide sound knowledge of various numerical methods.
- To apply various numerical methods to obtain solution of different types of equations such as transcendental, simultaneous, ODE etc. and also for interpolation, integration and differentiation.
- To impart skills to develop programs using C language.

Course Outcome: Upon successful completion of this course, the students will be able to :-

- Develop algorithms and implement programs using C language for various numerical methods.
- Demonstrate types of errors in computation and their causes of occurrence.
- Identify various types of equations and apply appropriate numerical method to solve different equations.
- Apply different numerical methods for interpolation, differentiation and numerical integration.
- Apply and compare various numerical methods to solve first and second order ODE.
- Apply and compare various numerical methods to solve linear simultaneous equations.

PROGRESSIVE EDUCATION SOCIETY'S

MODERN COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING

Academic Activity Planner

Units	Test1 /Assignment1	Test2 / Assignment2	End-Term Test
1	✓		
2	✓		
3		✓	
4		✓	
5			✓
6			✓

Teaching Plan:

Teaching plan as per University Syllabus

Sr.No.	Unit	Broad Topics to be Covered	Total Lecture Planned
1	I	Basics of C Language	08
2	II	Numerical Methods , Errors and Concept of root of	08
3	III	Solution of Transcendental and polynomial equation and Curve Fitting	08
4	IV	Interpolation and Numerical Differentiation	08
5	V	Solution of Ordinary Differential Equation (ODE) and Numerical Integration	08
6	VI	Solution of linear simultaneous equation	08

Unit wise Lecture Plan

Unit No.-I: BASICS OF C LANGUAGE

Pre-requisites:- Fundamentals of Programming languages.

Objectives:-

- To understand Basic concepts in C-programming.

Outcomes:

The students will be able to:-

- Develop algorithms and implement programs using C language for various numerical methods.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Basics of 'C' language - Data types, Operators and its precedence.	T5, R3	Flip Classroom Activity & PPT
2	Control statements: 'if-else' and nested 'if-else'	T5, R3	Flip Classroom Activity & PPT
3	For, while and do-while' Loop operation.	T5, R3	Flip Classroom Activity & PPT
4	**Arrays:** Introduction, one and two dimensional arrays.	T5, R3	Flip Classroom Activity & PPT
5	Types of functions User Defined Functions - declaration and prototypes.	T5, R3	Flip Classroom Activity & PPT
6	Localand Global variables.	T5, R3	Flip Classroom Activity & PPT
7	**Pointers:** Introduction, declaring and initializing pointers.	T5, R3	Flip Classroom Activity & PPT
8	Programs	T5, R3	Flip Classroom Activity & PPT
9	Rubrics		

Question Bank: Theory

Unit :I

1) What are different types of data types in C-language? & Operator precedence.
2) Write down & explain Control statements in C-programming.
3) What is mean by array? Explain different types of arrays.
4) What is function? Explain different types of function.
5) Write a note on pointer

Unit No.-II: Numerical Methods, Errors and Concept of root of equation

Pre-requisites:-

Basic of error and concept of numerical method.

Objectives:-

To emphasize the need of computational techniques and analyze errors involved in the computation

Outcomes:-

After successfully completing this unit students will be able:
Demonstrate types of errors in computation and their causes of occurrence

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Basic principle of numerical methods. Floating point algebra	R4,R2 ,T6,T1,T3	Chalk & Talk
2	Floating point algebra with normalized floating point technique	R4,R2 ,T6,T1,T3	Chalk & Talk
3	Significant digits. **Errors**: Different types of errors.	R4,R2 ,T6,T1,T3	Chalk & Talk
4	Causes of occurrence and remedies to minimize them. Generalized error formula.	R4,R2 ,T6,T1,T3	Chalk & Talk
5	**Concept of roots** of an equation. Descartes' rule of signs	R4,R2 ,T6,T1,T3	Chalk & Talk
6	Sturm's theorem	R4,R2 ,T6,T1,T3	Chalk & Talk
7	Intermediate value theorem.	R4,R2 ,T6,T1,T3	Chalk & Talk
8	Synthetic division, Roots of Polynomial Equations using Birge-Vieta method.	Flip class room Activity	Flip Classroom Activity
9	Rubrics		

Question Bank: Theory Paper

1. Using normalized floating point algebra, perform the following arithmetic operations with 4 significant digits.

i. (0.1111E10) X (0.1234E15)
ii. (0.4546E3) X (0.5454E8)

2. Using Birge vieta method find a real root correct up to three significant decimals of the following equation.

1. $x^6 - x^4 - x^3 - 1 = 0$
2. Take initial approx. $P_0 = 1.5$

3. State and explain Descart's rule of sign with example given as

a. $X^3 + 2x^2 + 10x - 20 = 0$

4. Explain
   a) Truncation error
   b) Relative error
   c) Absolute error

5. **5**. Write a note on Sturm's theorem and intermediate value theorem

Unit No.-III: SOLUTION OF TRANSCENDENTAL AND POLYNOMIAL EQUATION AND CURVE FITTING

Pre-requisites:-

Basic concepts of polynomial equation and concept of root.

Objectives:-

- To apply various numerical methods to obtain solution of different types of equations such as transcendental**,** polynomial equation and to impart skills to develop programs using C language.

Outcomes:

After successfully completing this unit students will be able to:

Identify various types of equations and apply appropriate numerical method to solve different equations

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	**Solution of Transcendental and polynomial equation:** Bisection method.	T2,T3,T4, R2	Flip Classroom Activity
2	Secant Method	T2,T3,T4, R2	Chalk & talk
3	Regula-Falsi Method	T2,T3,T4, R2	Chalk & talk
4	Newton-Raphson methods	T2,T3,T4, R2	Chalk & talk
5	Chebyeshev Method	T2,T3,T4, R2	Chalk & talk
6	Newton-Raphson method for two variables Method	T2,T3,T4, R2	Flip Classroom Activity
7	**Curve Fitting** using least square approximation – First order and second order.	T2,T3,T4, R2	Flip Classroom Activity
8	Numerical practice	T2,T3,T4, R2	Chalk & talk
9	Rubrics		

Question Bank: Theory

Theory Paper

1) What is mean by curve fitting?
2) Explain 1st order and 2nd order least square approximation.
3) Explain the Chebyshev method.
4) The current is particular circuit is given by
   $I^3 - 5I - 7 = 0$.

Find the value of current using bisection & Regula falsi method.
Correct upto 3 decimal places.

5) Find the smallest positive root of x3 - 5x + 3 = 0 using N-R method using 4 iterations.
6) Use secant method to determine the root of following equation

$$f(x) = \cos x - xe^x = 0$$

Find the root up to 3 decimal places.

7) Explain the N-R two variable method.

Unit No.-IV: INTERPOLATION AND NUMERICAL DIFFERENTIATION

Pre-requisites:- Linear Algebra.

Objectives:-

- To provide sound knowledge of various numerical methods.
- To apply various numerical methods to obtain solution of different types of Interpolation and Numerical Differentiation

Outcomes:

After successfully completing this unit students will be able to:

Apply different numerical methods for interpolation, differentiation.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	**Interpolation:** Difference operators	T2,T3,T4, R2	Flip Classroom Activity
2	Introduction to interpolation - Newton's forward interpolation formulae	T2,T3,T4, R2	Flip Classroom Activity
3	Newton's backward interpolation formulae	T2,T3,T4, R2	Flip Classroom Activity
4	Sterling's and Bessel's central difference formulae	T2,T3,T4, R2	Flip Classroom Activity
5	Newton's divided difference formula	T2,T3,T4, R2	Flip Classroom Activity
6	Lagrange's interpolation	T2,T3,T4, R2	Flip Classroom Activity
7	**Numerical Differentiation** using Newton's forward interpolation formulae	T2,T3,T4, R2	Flip Classroom Activity
8	**Numerical Differentiation** using Newton's backward interpolation formulae.	T2,T3,T4, R2	Flip Classroom Activity
9	Rubrics		

Question Bank: Theory
Theory Paper

1) Following table gives relation between x and y. Determine y(3.5) and y(8.5) using appropriate interpolation formula.

X	3	4	5	6	7	8	9
Y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

2) Use Newton's divided difference interpolation formula to evaluate f(3) from the following table

X	0	1	2	4	5	6
F(x)	1	14	15	5	6	19

3) Derive the Sterling's and Bessel's central difference formula.
4) From the following table of values of x and y obtain (dy/dx) and (d^2y/dx^2) for x=1.2 and x=2.

X	1	1.2	1.4	1.6	1.8	2	2.2
Y	2.7183	3.3201	4.0552	4.9530	6.0496	7.3891	9.0250

5) Write a note on Newton's forward and backward interpolation method.
6) Explain in detail Newton's divided difference method.

Unit No.-V: SOLUTION OF ORDINARY DIFFERENTIAL EQUATION (ODE) AND NUMERICAL INTEGRATION

Pre-requisites:-Concept of ordinary differential equations.

Objectives:-

To apply various numerical methods to obtain solution of different types of equations such ODE

Outcomes:-After successfully completing this unit students will be able to:

Apply and compare various numerical methods to solve first and second order ODE

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	**Solution of First order Ordinary Differential Equation (ODE)** using Taylor'sseries method	T2,T3,T4, R2	Chalk & talk
2	Euler's methods	T2,T3,T4, R2	Chalk & talk
3	Modified Euler's methods	T2,T3,T4, R2	Chalk & talk
4	Runge-Kutta second order methods	T2,T3,T4, R2	Chalk & talk
5	Runge-Kutta fourth order methods	T2,T3,T4, R2	Chalk & talk
6	**Solution of Second order ODE** using 4th order Runge-Kutta method	T2,T3,T4, R2	Flip Classroom Activity
7	**Numerical Integration:** Trapezoidal and Simpson's rules	T2,T3,T4, R2	Flip Classroom Activity
8	Simpson's rules as special cases of Newton-Cote's quadrature technique for single and double integrals.	T2,T3,T4, R2	Chalk & talk
9	Rubrics		

Question Bank: Theory
Theory Paper

1) Use Simpson's 1/3rd rule and trapezoidal rule to evaluate $\int_0^{12} \log(1 + x * x)dx$ by taking suitable number of intervals.
2) Write a note on R-K method.
3) Apply Euler's method to solve $y' = -xy^2$, $y(0) = 2$. Compute up to $x = 1$ with $h = 0.1$
4) Solve the following equations
   $d^2y/dx^2 = x\,(dy/dx) - y$

UNIT NO.-VI: SOLUTION OF LINEAR SIMULTANEOUS EQUATION

Pre-requisites:-
Basic concept of simultaneous equations

Objectives: - To impart skills to develop programs using C language.
To provide sound knowledge of various numerical methods.

Outcomes:-After successfully completing this unit, students will be able to:
Apply and compare various numerical methods to solve linear simultaneous equations

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	**Solution of simultaneous equation:** Direct methods - Gauss elimination Mathod	T2,T3,T4, R2	Chalk & talk
2	Gauss-Jordan methods	T2,T3,T4, R2	Chalk & talk
3	concept of pivoting – partial and complete	T2,T3,T4, R2	Chalk & talk
4	Iterative methods – Jacobi Method	T2,T3,T4, R2	Chalk & talk
5	Gauss Seidel method	T2,T3,T4, R2	Flip Classroom Activity
6	**Matrix Inversion** using Jordon method	T2,T3,T4, R2	Chalk & talk
7	Eigen values using Power method	T2,T3,T4, R2	Flip Classroom Activity
8	Numericals	T2,T3,T4, R2	Chalk & talk
9	Rubrics		

Question Bank: Theory

Theory Paper

1) Solve the following system of equations using Gauss elimination method
   2x+y-0.1z+t=2.7
   0.4x+0.5y+4z-8.5t=21.9
   0.3x-y+z+5.2t= -3.9
   X+0.2y+2.5z-t=9.9
2) Solve the following system of equations using Gauss Jordon method
   $2x_1+x_2+2x_3+x_4=6$
   $6x_1-6x_2+6x_3+12x_4=36$
   $4x_1+3x_2+3x_3-3x_4= -1$
   $2x_1+2x_2-x_3+x_4=10$
3) Write a note on Gauss Seidel iterative method.
4) Write a note on Jacobi method of symmetric matrices for finding eigen values and eigen vectors.
5) Explain Gauss Jordon method.
6) Write a note on Gauss elimination method.
7) Explain: Partial pivoting.

Practical Assessment

List of Experiments:

Term work shall consist of minimum **EIGHT** computer programs in C language with flowcharts and results.

1. Solution of a polynomial equation using Birge-Vieta method.
2. Solution of a transcendental equation using Bisection or Regula-Falsi method.
3. Solution of two variable non-linear equation using N-R method.
4. Program for interpolation using Newton's forward or backward interpolation.
5. Program for interpolation using Lagrange's or Newton's Divided difference interpolation.
6. First order curve fitting using Least square approximation.
7. Solution of simultaneous equation using Gauss Seidel or Jacobi method.
8. Solution of simultaneous equation using Gauss elimination or Jordon method.
9. To find largest Eigen value using Power method.
10. Solution of Numerical Integration using Simpson's (1/3) rd or (3/8) th rule.
11. Solution of first order ODE using 4th order RK method or Modified Euler method.

FUNDAMENTALS OF MICROCONTROLLER AND APPLICATIONS

Name of the Subject –Fundamentals of Microcontroller and Applications

Weekly Work Load(in Hrs)	Lecture	Practical
	04	02

Online/ In-sem	Theory	Practical	Oral	Term-work	Total Marks	Credit
50	50	-	50	-	150	

Syllabus:

Unit 01 :(8 Hrs)

Introduction to concept of microcontroller, comparison of Microprocessor and microcontroller, Comparison of all 8 bit microcontrollers, Intel 8051 microcontroller architecture, Pin diagram, Memory organization of 8051, special function registers, Internal structure of I/O ports, operation of I/O ports. Interfacing of 8051 with external memory.

Unit 02 : (8 Hrs)

Addressing modes of 8051, Instruction set of 8051, Stack and Stack Related instruction, Data exchange, byte level logical operations, bit level logical operations, rotate and swap operations, instruction affecting flags, incrementing, decrementing, arithmetic operations, jump and recall instruction, Call and return subroutines.

Unit 03 : (8 Hrs)

Assembly language programming of 8051. Counters and timers in 8051, timer modes and its programming.

Unit 04 : (8 Hrs)

Interrupts- timer flag interrupt, serial port interrupt, external interrupts, software generated, interrupt control and interrupt programming. Serial communication and its programming. Serial data input, output, Serial data modes, interfacing of 8051 with PC through RS232.

Unit 05 : (8 Hrs)

Microcontroller development tools- study of simulator, emulator, assemblers, programmers, cross assembler for microcontrollers. Study, interfacing and programming of PPI 8255—mode 0, 1, BSR mode. Interfacing of 8051 with 8255 for expanding of I/O. Programming and Interfacing of 8051 with 8 bit ADC (0809) and DAC (0808).

Unit 06 : **(8 Hrs)**

Part A: (Theoretical Treatment only)

Measurement of parameters such as matrix (4 x 4) Keyboard pressure, temperature, flow, level, voltage, current, power (KW), power factor and frequency using 8051.

Part B: Interfacing and Programming

Interfacing of 8051 with single key, LED, Relay, voltage, current, speed control of dc motors, Stepper motor control (speed /position).

Text Books:

[T1] V Udayashankara and M S Mallikarjunaswamy, "8051 Microcontroller, Hardware, software and applications", TATA McGraw Hill.

[T2] Muhammad Ali Mazidi, J.G. Mazidi, "The 8051 Microcontroller and Embedded Systems", Pearsons Publishers.

[T3] Ajay Deshmukh, "Microcontroller 8051" –TATA McGraw Hill.

[T4] Theagrajan," Microprocessor and Microcontroller", BS Publication.

[T5] K. J. Ayala, "The 8051 Microcontrollers- Architecture, Programming and Applications", Peram International Publications.

[T6] Subrata Ghoshal, "8051 microcontroller", Pearsons Publishers.

Reference Books:

[R1] Scott Mackenzie, "8051 Microcontroller", Pearson Education.

[R2] Intel Microcontroller data book.

[R3] Intel Corporation 1990- 8 bit embedded controller handbook.

List of Experiments:

Compulsory Experiments:

1. Study and use of 8051 Microcontroller trainer kit.
2. Assembly Language Program for arithmetic operation of 8 bit numbers.
3. Assembly Language Program for finding largest number and smallest number from a given array of 8 bit numbers.
4. Assembly Language program to arrange 8 bit numbers stored in array in ascending order and descending order.
5. Assembly Language Program for data conversion.
6. Assembly Language Program for use of Timer/Counter for various applications.

Any six experiments are to be conducted of following experiments:

1. Implementation of Serial Communication by using 8051 serial ports.
2. Programming using cross assembler.
3. Blinking display of LED's interfaced with 8051 through 8255.
4. Interfacing of 8 bit DAC 0808 with 8051 to generate various waveforms.
5. Interfacing of 8 bit ADC 0809 with 8051 Microcontroller.
6. Interfacing of relay with 8051.

7. Stepper motor control by 8051 Microcontroller.
8. Interfacing of matrix keyboard/ 7 segment display with 8051.

Publication.**IS/IEEE Standards:**

Reference Web Links/ Research Paper/ Referred Book other than Mention in Syllabus:

1. http://nptel.ac.in

2.http://freevideolectures.com/Course/3018/Microprocessors-and-Microcontrollers/29**[IIT Kharagpur Course , Prof. Ajit Pal]**
3.http://www.keil.com/dd/docs/datashts/intel/80xxah_ds.pdf

Course Objectives

1 To understand the differences between microcontrollers and microprocessors learn Microcontroller architecture & describe the features of a typical microcontroller.
2 To use the 8051 addressing modes and instruction set and apply this knowledge to perform programs - arithmetic & logic operations, data & control transfer operations, Input & output operations.
3 To define the protocol for serial communication and understand the microcontroller Development systems.
4 To build and test a microcontroller based system; interface the system to switches, Keypads, displays, A/D and D/A converters.
5 To provide students with the concepts and techniques required in designing computer hardware interfaces embedded software for microcontrollers and measurement of Various analog parameters.

Course Outcomes

CO1 Students will be able to explain microcontroller 8051.
CO2 Students will be able to develop programming using 8051, addressing modes and instruction set.
CO3 Students will be able to illustrate the capability of stack, program counter and timers.
CO4 Student will be able to interface microcontroller with external device like switches, keypads, displays, A/D and D/A
CO5 Student will be able to develop serial communication programming.
CO6 Students will be able to explain and develop programs for various interrupt in 8051.

• Academic Activity Planner

Units	MCQ (Each 10marks)	Unit Test	Term End Test 3rd(50marks)
1	MCQ	✓	
2	MCQ	✓	
3	MCQ	✓	
4	MCQ	✓	
5			✓
6			✓

Teaching Plan

Teaching plan as per University Syllabus

Sr. No.	Unit	Broad Topics to be Covered	Total Lecture Planned (in Hrs)
1	I	comparison of Microprocessor and microcontroller, Comparison of all 8 bit microcontrollers, CISC-RISC, Harvard & Von Neumann architecture, 8051 architecture, Pin diagram, Memory organization of 8051- (RAM organization), special function registers, Internal structure of I/O ports, operation of I/O ports. Interfacing of 8051 with external memory.	08
2	II	8051 Addressing modes, Instructions set, Stack and Stack Related instruction, Data exchange, byte level logical operations, bit level logical operations, rotate and swap operations, instruction affecting flags, incrementing, decrementing, arithmetic operations, jump and recall instruction, Call and return subroutines	08
3	III	Assembly language programming of 8051. Counters and timers in 8051, timer modes and its programming.	08
4	IV	Interrupts- timers and it's programming. Serial communication and its programming. Serial data input, output, Serial data modes, interfacing of 8051 with PC through RS232.	08
5	V	Microcontroller development tools- study of simulator, emulator, assemblers, programmers, cross assembler for microcontrollers. Study, interfacing and programming of PPI 8255—mode 0, 1, BSR mode. Interfacing of 8051 with 8255 for expanding of I/O. Programming and Interfacing of 8051 with 8 bit ADC (0809) and DAC (0808).	08
6	VI	Measurement of parameters such as matrix (4 x 4) Keyboard pressure, temperature, flow, level, voltage, current, power (KW), power factor and frequency using 8051. And programming of Interfacing of 8051 with single key, LED, Relay, voltage, current, speed control of dc motors, Stepper motor control (speed /position).	08

Unit wise Lecture Plan

Unit No.-I

Pre-requisites:-Basic concepts of Micro Controllers

Objectives:-

- To understand difference between microprocessor and microcontroller.
- To understand different types of microcontrollers, 8051 architecture, pin diagram.
- To study the concept of interfacing and operation of Input output ports.

Outcomes: Student can

- **Differentiate** between microprocessor and microcontroller**.**
- **Describe** the architecture and features of various types of microcontroller.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Introduction to concept of microcontroller, comparison of Microprocessor and microcontroller, difference between CISC RISC, Difference between Von Neumann and Harvard architecture, Comparison of all 8 bit microcontrollers.	**T1,T2,T3,T4 R1,R2,R3,R4**	Chalk & talk
2	Description for Intel 8051 microcontroller architecture, Pin diagram.		PPT
3	How to find address range for the given memory range, Memory organization of 8051-RAM Organization.		Chalk & talk
4	Special function registers, its size, range. Explanation on bit addressable and byte addressable.		Chalk & talk
5	Internal structure of I/O ports		Chalk & talk
6	Explanation for operation of I/O ports as I/O and alternative function.		Chalk & talk
7	Interfacing of 8051 with external memory.		Chalk & talk
8	Examples on above topics		Chalk & talk
9	**Rubrics**		
10	**Rubrics**		

Question Bank: Theory- Unit: I

1. What is the size of the internal RAM memory of the 8051?
2. The 8051 has _____ 16-bit counter/timers.5.
3. Name 2 register that consists of 16 bit.
4. What are SFR?
5. List all the registers used in 8051 microcontroller in brief.
6. Draw the memory organization of mcs – 51.
7. What are all addressing modes of mcs-51?
8. Enlist the various flags in the PSW register.
9. Draw the block diagram of 8051 microcontroller.
10. How many I/O ports are placed in microcontroller 8051?
11. What is use of EA pin?
12. How many bit addressable location are placed in internal RAM?

Unit No.-II:

Pre-requisites:-

Basics of numbering system.

Objectives:-

To use the 8051 addressing modes and instruction set and apply this knowledge to perform programs - arithmetic & logic operations, data & control transfer operations, input & output operations.

Outcomes:-After successfully completing this unit students will be able:

To understand practical aspects of condition monitoring and maintenance of Transformer

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Different types of Addressing modes in 8051 with example.	T1,T2,T3,T4 R1,R2,R3,R4	Chalk & talk
2	Instructions set explanation with addressing modes with no. bytes taken by instruction		PPT
3	Instructions set explanation with addressing modes with no. bytes taken by instruction		Chalk & talk
4	Explanation on Stack and Stack Related instructions (PUSH & POP) with examples, explanation of program counter.		Chalk & talk
5	Data exchange(XCHD, XCH), byte level logical operations, bit level logical operations,		Chalk & talk
6	Rotate (RL, RLC, RR, RRC) and swap operations with examples, incrementing, decrementing.		Chalk & talk
7	Arithmetic operations, jump and recall instruction, Call and return subroutines		Chalk & talk
8	Instruction affecting flags		Chalk & talk
9	**Rubrics**		
10	**Rubrics**		

Question Bank: Theory

1 Mention any two examples of direct addressing instructions?

2 What are all addressing modes of mcs-51?

3 Define stack, stack pointer and their operation for mcs-8051.
4 Define SWAP and Rotate instruction
5 define call and return subroutine.

Unit No.-III

Pre-requisites :-

Instruction sets

Objectives :-

1. To use the 8051 addressing modes and instruction set and apply this knowledge to perform programs - arithmetic & logic operations, data & control transfer operations, input & output operations.

Outcomes:-After successfully completing this unit students will be able to:

Understand Programming using different instructions,

To do assembly language programming.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	assembly language Programming	T1,T2,T3,T4 R1,R2,R3,R4	Chalk & talk
2	assembly language Programming		PPT
3	Timers and counter application, working of timers.		Chalk & talk
4	TMOD TCON Explanation		Chalk & talk
5	Timer modes		Chalk & talk
6	Timer programming.		Chalk & talk
7	Questions on programming		Chalk & talk
8	Questions on programming		Chalk & talk
9	**Rubrics**		
10	**Rubrics**		

Question Bank

1. What is the operation carried out when 8051 executes the instruction MOVC A,@A+DPTR?
2. State the function of M1 and M0 bits in TMOD register?
3. Define Timers and Counters in 8051.
4. Define modes of Timer.
5. Store 8-bit immediate data 65H into accumulator.
6. Load 42h and 55H in register R0 and R1 respectively.
7. Place the contents of external memory location 8000H into accumulator.
8. Load 45H in external memory location 8000H.
9. Write program instructions to load a byte in memory location 9000H and increment the contents of the memory location

Unit No.-IV

Pre-requisites :-

Instruction sets

Objectives :-

To define the protocol for serial communication and understand the microcontroller development systems.

Outcomes:-After successfully completing this unit students will be able to:

Students can demonstrate programming of microcontroller 8051, and implement data communication/interfacing of peripheral devices with microcontroller 8051

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Interrupts- difference between interrupt and polling, various types of interrupt sources and their priority and vector address. IP, IE registers and its explanation.	T2,T5 R2	Chalk & talk
2	Timer flag interrupt and its programming steps and some examples.		PPT
3	external interrupts, software generated, interrupt control and interrupt programming.		PPT, Chalk & talk
4	Serial communication, difference between serial and parallel communication, framing, SBUF, SCON, SMOD bit.		Chalk & talk
5	Modes of serial communications, baud rate calculation of THx (count) for different mode rates, interfacing of 8051 with PC through RS232		PPT, Chalk & talk
6	Programming to data transfer and receive.		Chalk & talk
7	Programming to data transfer and receive		Chalk & talk
8	serial port interrupt and its programming		Chalk & talk
9	**Rubrics**		
10	**Rubrics**		

Question Bank

1.) Explain in detail the RS 232C interface
2.) Explain the different serial communication modes in 8051.
3.) Explain SBUF register of 8051.
4.) Describe the baud rate in UART 8051. On which factors it depends.
5.) Explain the operating modes of serial port of IC 8051 microcontroller.
6.) Draw & explain PCON register format of 8051.
7.) Draw the format of SCON register & explain the function of each bit.
8.) Write a program for serial port of 8051 to transfer letter "A" serially at 4800 baud rate continuously
9.) Explain 8051 provides 5 vectored interrupts. And define its priority.
10.) Explain interrupt register associated to timer, **External Hardware Interrupt, Serial Communication Interrupt.**

Unit No.-V:

Pre-requisites:- 8051 Pin Diagram and its functions, instruction sets

Objectives:-

- To build and test a microcontroller based system; interface the system to switches, keypads, displays, A/D and D/A converters.
- To provide students with the concepts and techniques required in designing computer hardware interfaces embedded software for microcontrollers and measurement of various analog parameters.

Outcomes:-After successfully completing this unit students will be able to:

Design electrical circuitry to the Microcontroller I/O ports in order to interface with external devices.

Students can perform measurement of different parameters using microcontroller.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Microcontroller development tools- study of simulator, emulator, assemblers, programmers, cross assembler for microcontrollers.	T2,T5,R2	Chalk & Talk
2	Study, interfacing of PPI 8255—mode 0, 1, BSR mode.		Chalk & Talk
3	Programming of PPI 8255 in I/O and in BSR mode		Chalk & Talk
4	Interfacing of 8051 with 8255 for expanding of I/O.		Chalk & Talk
5	8 bit ADC (0809) and DAC (0808).		Chalk & Talk
6	Interfacing of 8051 with 8 bit ADC (0809) and DAC (0808).		Chalk & Talk
7	Programming of 8 bit ADC (0809) and DAC (0808).		Chalk & Talk
8	Programming of with 8 bit ADC (0809) and DAC (0808).		Chalk & Talk
9	Rubrics		Chalk & Talk
10	Rubrics		Chalk & Talk

Question Bank:

1.) Explain the use of simulator, emulator, assemblers, programmers, cross assembler for microcontrollers
2.) List operating modes of 8255. Draw the control word register of I/O mode and BSR mode.
3.) Write a program to set PC7 and reset it after sometime using BSR mode.
4.) Write the control word format of 8255 for the following configuration. PortA Input, PortB Output, Port C_{upper} Input and C_{lower} as Input.
5.) Explain the functions of the following pins: 1.) SOC 2.) ADDA, ADDB, ADDC 3.) Output Enable.
6.) Write a program to generate triangular, sawtooth waveform using DAC.
7.) With neat diagram explain the ADC interface to 8051.

Unit No.-VI

Pre-requisites:-

8051 Pin Diagram and its functions, instruction sets

Objectives: - To build and test a microcontroller based system; interface the system to switches, keypads, displays, A/D and D/A converters.

To provide students with the concepts and techniques required in designing computer hardware interfaces embedded software for microcontrollers and measurement of various analog parameters.

Outcomes:-After successfully completing this unit, students will be able to:

Students can perform measurement of different parameters using microcontroller.
Students can describe parameters for measurement.

Lecture No.	Details of the Topic to be covered	References	Mode of Delivery
1	Measurement of parameters such as matrix (4 x 4) Keyboard pressure.	T2,T5,R2	Chalk & Talk
2	Temperature flow, level, voltage.		Chalk & Talk
3	Current, power (KW), power factor and frequency using 8051.		Chalk & Talk
4	Interfacing of 8051 with single key, LED.		Chalk & Talk
5	Interfacing of 8051 with single key, LED, programming		Chalk & Talk
6	Relay, voltage, current		Chalk & Talk
7	speed control of dc motors, Programming		Chalk & Talk
8	Stepper motor control (speed /position), programming		Chalk & Talk
9	RUBRICS		Chalk & Talk
10	RUBRICS		Chalk & Talk

Question Bank

1.Explain Interfacing of 8051 with single key, LED, Relay, voltage, current, speed control of dc motors, Stepper motor control (speed /position).
2.With the help of block diagram explain measurement of power factor, power, 4x4 keyboard.
3.programming to control DC and Stepper motor.
4.Explain LM35 and it interfacing with 8051.
5.what is optoisolator.

LINKS

http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/microcontrollers/micro/ui/Course_home2_9.html

Exp. No.	Name of Experiment
1	Study and use of 8051 microcontroller trainer kit
2	Assembly language program for arithmetic operation of 8-bit number
3	Assembly language program for finding largest and smallest number from a given array of 8-bit numbers
4	Assembly language program to arrange 8-bit numbers stored in array in ascending and descending order
5	Assembly language program for data conversion
6	Assembly language program for use of timer/counter for various applications
7	Blinking display of LED's interfaced with 8051 through 8255
8	Interfacing of 8-bit DAC 0808 with 8051 to generate various waveforms
9	Interfacing of 8-bit ADC 0809 with 8051 microcontroller
10	Interfacing of relay with 8051
11	Stepper motor control by 8051 microcontroller
12	Interfacing of matrix keyboard/7 segment display with 8051
13	Interfacing of keypad LCD using ATMEGA328P

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MODERN COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRICAL ENGINEERING

Unit 1

Theory Paper

[Total No. of Questions = 2]

[Total No. of Pages = 1]

S.E. (Electrical) 2015-Course (Credit pattern)

Subject Code:_____ Subject Name: ADE

Semester: II (2019-20) Exam: _____

[Time: 1 Hours] [Max Marks =] [-Credits]

Instructions to Candidates:

1. **Answer any Questions**
2. **Use single answer book for all questions.**
3. **Figures to the right of each question indicate full marks.**
4. **Use of Scientific calculator is allowed.**

Q. 1	**a)**		[5]
	b)		

Q. 2	**a)**		**[5]**
	b)		

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DEPARTMENT OF ELECTRICAL ENGINEERING

Unit

Tutorial

[Total No. of Questions = 2]

[Total No. of Pages = 1]

S.E. (Electrical) 2015-Course (Credit pattern)

Subject Code:_____ Subject Name: ADE

Semester: II (2019-20) Exam: _____

[Time: 1 Hours] [Max Marks =] [-Credits]

Instructions to Candidates:

1. **Answer any Questions**
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3. **Figures to the right of each question indicate full marks.**
4. **Use of Scientific calculator is allowed.**

CO1		**[5]**
CO2		**[5]**
CO3		**[5]**
CO4		**[5]**
CO5		**[5]**
CO6		**[5]**

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MCQ

[Total No. of Questions = 2]
[Total No. of Pages = 1]
S.E. (Electrical) 2015-Course (Credit pattern)
Subject Code:_____ Subject Name: ADE
Semester: II (2019-20) Exam: _____
[Time: 1 Hours] [Max Marks =] [-Credits]

Instructions to Candidates:

1. **Answer any Questions**
2. **Use single answer book for all questions.**
3. **Figures to the right of each question indicate full marks.**
4. **Use of Scientific calculator is allowed.**

Q. 1				**1 m**
a	**b**	**c**	**d**	
Q. 2				**1 m**
a	**b**	**c**	**d**	
Q. 3				**1 m**
a	**b**	**c**	**d**	
Q. 4				**1 m**
a	**b**	**c**	**d**	
Q. 5				**1 m**
a	**b**	**c**	**d**	
Q. 6				**1 m**
a	**b**	**c**	**d**	
Q. 7				**1 m**
a	**b**	**c**	**d**	
Q. 8				**1 m**
a	**b**	**c**	**d**	
Q. 9				**1 m**
a	**b**	**c**	**d**	
Q. 10				**1 m**
a	**b**	**c**	**d**	

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Assignment

[Total No. of Questions = 2]
[Total No. of Pages = 1]
S.E. (Electrical) 2015-Course (Credit pattern)
Subject Code:_____ Subject Name: ADE
Semester: II (2019-20) Exam: _____
[Time: 1 Hours] [Max Marks =] [-Credits]

Instructions to Candidates:

1. **Figures to the right of each question indicate full marks.**
2. **Use of Scientific calculator is allowed.**

Q.1 **a)** **b)**		**[10]**
Q.2 **a)** **b)**		**[10]**

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