SUBJECT TITLE : BASIC ELECTRICAL ENGINEERING
SUBJECT CODE :
PEIODS/WEEK : 4
PERIODS/SEMESTER : 72
CREDITS : 4

TIME SCHEDULE

Module	Topic	Periods
I	DC Circuit & Network Theorems Test 1	17 1
II	Electrostatics & Magnetism Test 2	17 1
III	Electromagnetism & AC Fundamentals Test 3	17 1
IV	Single Phase AC Circuits Test 4	17 1
Total		**72**

OBJECTIVES

MODULE I

1.0.0 Define temperature coefficient of resistance and state the effect of temperature on resistance
1.0.1 Solve problems on temperature co-efficient of resistance and resistivity
1.1.2 Define Voltage source and current source and show its conversion .
1.1.3 Define Dependent and independent source , Linear , non linear , unilateral and bilateral circuit .
1.1.4 Explain Voltage and current division in a DC network .
1.1.5 Solve simple problems on Electric power and energy in D.C. Circuits .
1.2.0 State Kirchoff's voltage and current law
1.2.1 Distinguish the sign conventions for voltage drop and e.m.f in a branch of a network
1.2.2 Calculate the unknown values in a network by applying Kirchoff's law
1.2.3 State the super position theorem , Thevenin's theorem and Norton's theorem and Compute the unknown quantity in a network by applying these theorems
1.2.4 State Maximum power transfer theorem and Reciprocity theorem

MODULE II

2.0.0 Define Absolute permittivity and relative permittivity in a medium
2.0.1 Define the terms electric field strength, electrostatic induction, flux density
2.0.2 Differentiate between potential and potential difference
2.0.3 Derive the expression for potential at a point in the air
2.0.4 Illustrate the potential of a charged sphere
2.0.5 Define the term potential gradient, break down voltage and dielectric strength
2.0.6 State the laws of Electrostatics
2.0.7 Describe the idea of Charging and Discharging of a capacitor
2.1.0 Relate capacitance, charge and P.D. of a capacitor
2.1.1 Derive the expression for capacitance of an isolated sphere
2.1.2 Describe spherical capacitor
2.1.3 Derive the capacitance of a parallel plate capacitor in a uniform dielectric medium
2.1.4 Derive the expressions for capacitance of series and parallel connected capacitors
2.1.5 Explain the idea of fixed capacitors and variable capacitors
2.1.6 Derive the formula for energy stored in a capacitor
2.1.7 Solve problems on parallel plate capacitor, Series – parallel connection of capacitor
and energy stored in a capacitor
2.2.0 Define the term absolute permeability and relative permeability of a medium
2.2.1 Explain the term field strength, magnetizing force, flux and flux density in associated with magnetic circuits
2.2.2 Derive the relation between flux density and magnetizing force
2.2.3 Draw the B-H curve
2.2.4 Identify the different regions in the BH curve
2.2.5 Derive an expression for the force produced by current carrying conductor placed in a magnetic field
2.2.5 Derive the expression for the force on a long conductor and long solenoid
2.3.0 Express the relation between m.m.f , flux and reluctance of a magnetic circuit
2.3.1 Compute the ampere turns of a given electromagnet
2.3.2 Compare magnetic circuit and electric circuit

MODULE III

3.0.0 State Faraday's laws of Electro magnetic induction
3.1.0 Determine the induced emf by Faradays Laws of electro magnetic induction
3.1.1 State Lenz's law
3.1.2 Differentiate statically and dynamically induced e.m.f
3.1.3 Differentiate between self induced e.m.f and mutually induced e.m.f with expressions
3.1.4 Define self inductance and mutual inductance
3.1.5 Obtain the formula for co-efficient of coupling
3.1.6 Solve problems in electromagnetic induction
3.1.7 Derive the expression for energy stored in a magnetic circuit
3.1.8 Determine energy stored in magnetic field
3.1.0 Describe the generation of alternating voltage and derive EMF equation
3.1.1 Define cycle, frequency, time period, amplitude, average value, Instantaneous value R.M.S value, form factor and peak factor of alternating quantities

3.1.2 Describe the phase and phase difference of alternating voltage and current
3.1.3 Compute the average and R.M.S value of voltage and current in respect of Sinusoidal wave form
3.1.4 Relate the frequency, number of poles and speed of an A..C. generator

MODULE IV

4.0.0 Represent the alternating quantity in phasor form
4.0.1 Explain addition and subtraction of alternating quantities by phasor method
4.0.2 Solve problems on addition and subtraction of alternating quantities by phasor method
4.0.3 Explain polar form, Rectangular form and trigonometric form of phasors
4.0.4 Convert the polar form into trigonometric and rectangular form and vice versa
4.0.5 Explain mathematical operation of alternating quantities (addition, subtraction and multiplication etc.) in polar and rectangular form .
4.1.1 Explain RL, RC series circuits with wave form and phasor diagram
4.1.2 Explain Impedance and impedance triangle
4.1.3 Define Apparent power, Reactive power , true power
4.1.4 Explain the concept of power factor
4.1.5 Solve RL and RC circuit to determine XL, XC, Z , P.F, phase angle and current .
4.1.6 Explain RLC series circuit with wave form and phasor diagram
4.1.7 Solve RLC series circuit for voltage , current , power , power factor and Impedance
4.1.8 Describe the resonance condition in R-L-C series circuits and derive resonant frequency
4.1.9 Solve resonance in series RLC circuit
4.2.0 Describe parallel ac circuit
4.2.1 Define Admittance, susceptance and conductance
4.2.2 Compute the unknown quantity in parallel RLC combination by phasor method
4.2.3 State Resonance in parallel circuit

CONTENT DETAILS

MODULE - I:
DC CIRCUIT & NETWORK THEOREMS

Effect of temperature on Resistance - Temperature co-efficient of resistance and problems. Calculation of Resistance of a conductor , Voltage source , current source and its conversion . Dependent and independent source , Linear , non linear circuit , unilateral and bilateral circuit . passive and active circuit, Voltage and current division in a branch of a DC network . Electric power and energy in D.C. Circuits. Simple problems

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Network Theorems - Kirchoff' Laws, Super position theorem, Thevenin's theorem, and Norton's theorem. Simple problems using the above theorems Maximum power transfer theorem and Reciprocity theorem .

MODULE II:
ELECTROSTATICS & MAGNETISM

Absolute and relative permittivity of a medium, Dielectric constant - Laws of electrostatics., Field strength or field intensity, , Electric flux density - potential and potential difference, Potential at a point, Potential of a charged sphere – Equi potential surfaces - Potential gradient - Breakdown voltage and dielectric strength.
Capacitor – Charging and Discharging , capacitance - Capacitance of an isolated Sphere - Spherical capacitor and parallel plate capacitor - Variable capacitors - Capacitors in series and parallel Energy stored in a capacitor.
Magnetism
Absolute and relative permeability, field strength, magnetizing force, flux and flux density. Relation between flux density and magnetizing force, B.H. curve Force on a current carrying conductor lying in a magnetic filed - Magnetizing force of long straight conductor .
Magnetic circuit
Definition of magnetic circuit – magneto motive force, reluctance, Ampere turns, permeance, reluctivity. Comparison of magnetic and electric circuit – calculation of ampere turns – problems.

MODULE III:
ELECTROMAGNETISM & AC FUNDAMENTALS

Electro magnetic induction Faradays laws of electromagnetic induction - problems , Flemings right hand rule, Lenz's law , statically and dynamically induced e m f. Expression for dynamically and statically induced emf. Self inductance and mutual inductance , Co-efficient of self and mutual induction , co efficient of coupling – problems. Energy stored in magnetic field
A.C fundamentals
Generation of alternating voltage and current , EMF equation , Different forms of EMF equation values of voltage and current. Waveforms and harmonics , Definition of (a) cycle (b) frequency (c) time period (d) amplitude (e) average value (f) R.M.S. Value and instantaneous value (g) form factor and peak factor (h) phase and phase difference , derivation of r.m.s and average value for sinusoidal waveforms. Relation between f, p and n .

MODULE IV:
SINGLE PHASE AC CIRCUITS

Phasor representation of alternating quantities , vector diagrams using r.m.s. Values. Addition and subtraction of alternating quantities by vector method - problems. Phasor Algebra - Mathematical representation of vectors - polar form, Rectangular form ,Complex form and trigonometric forms. Addition, subtraction, multiplication & division of alternating quantities in these forms.
Series A.C circuits - AC through R L, R C, and R, L C circuits – active, Reactive and Apparent power, Power factor, Resonance in R-L-C series circuits, problems in series circuits (In polar and rectangular form). Parallel A.C circuits - phasor method , solving problems in RL and RC parallel circuit . Resonance in parallel circuit

REFERENCES:-

1. Electrical Technology Vol.I - B.L Thereja
2. Basic Electrical & Electronics Engg. - V.K Metha
3. Basic Electrical Engg. - Ashfaq Hussain