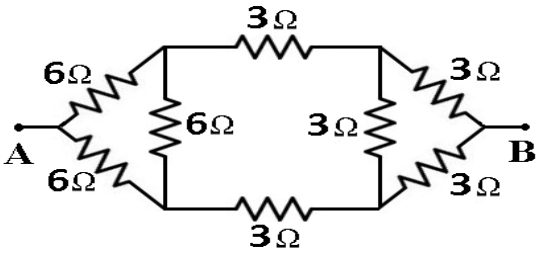
Basic Electrical Engineering

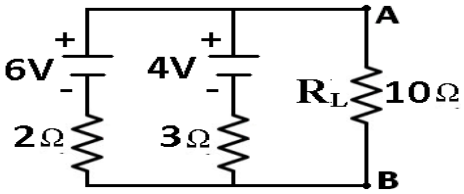
Question Bank

Unit 1

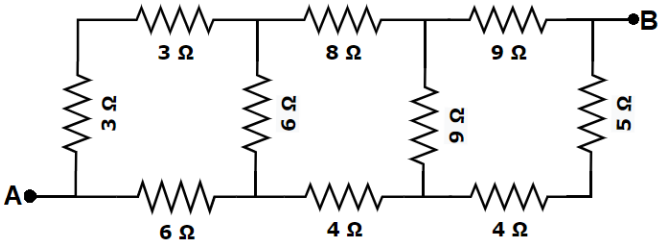
1. State and explain Superposition Theorem.
2. In the network shown in fig. find the resistance between the points A & B.



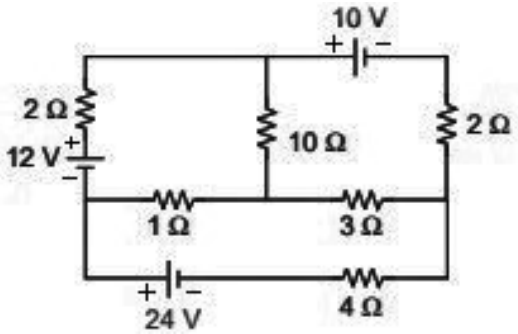
3. Derive the expression for conversion of star connected network into an equivalent delta connected network.
4. State Thevenin's theorem and find the current in load resistance (R_L) in the circuit shown in fig. by using same theorem.



5. State and explain Thevenin's theorem with suitable example.
6. Find the equivalent resistance between terminals A and B.

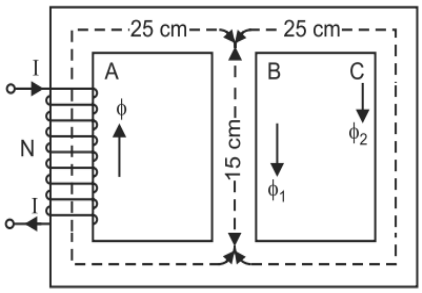


7. Derive the expression for conversion of delta connected network into an equivalent star connected network.
8. Find the current flowing through all branches using KVL.

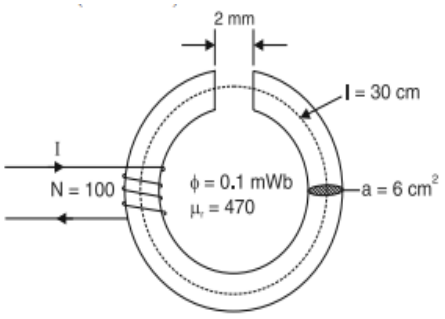


Unit 2

1. Explain the concept of magnetic leakage & magnetic fringing. Hence define leakage coefficient.
2. A cast steel magnetic structure made of a bar of section 2cm x 2cm is shown in fig. Determine the current that the 500-turn magnetizing coil on left limb should carry so that a flux of 2mWb is produced in the right limb. Take relative permeability as 600 and neglect leakage.



3. A ring of 30cm mean diameter is made up of round iron rod 2.5cm in diameter. At one end, a saw cut of 2 mm wide is made through it. It is uniformly wound with 500 turns of wire. Calculate the current required by the exciting coil to produce a flux of 4mWb. Assume relative permeability of iron as 800. Neglect leakage.
4. Explain similarities and dissimilarities of Electrical and Magnetic circuit.
5. Prove that: $\boldsymbol{k = \frac{M}{\sqrt{L_1 L_2}}}$
6. An iron ring of cross-sectional area 6 cm^2 is wound with a wire of 100 turns and has a saw cut of 2 mm. Calculate the magnetizing current required to produce a flux of 0·1 mWb if mean length of magnetic path is 30 cm and relative permeability of iron is 470.Neglect leakage and fringing.



7. Define:
   i) Magnetic flux ii) Magnetic flux density iii) Permeability
   iv)Magnetic field strength v) MMF vi) Reluctance vii) Permeance
8. Two coils A and B are kept in parallel planes such that 70% of the flux produced by coil A links with coil B. Coil A has 10000 turns and coil B has 12000 turns. A current of 4A in coil A produces a flux of 0.04mwb in it while a current of 4A in coil B produces a flux of 0.08mwb in it. Calculate:
   1) Self-inductance L_A & L_B 2) Mutual inductance M 3) Coupling coefficient

Unit 3

1. Derive an expression for current and power when pure inductor is connected across an AC voltage. Draw waveform and phasor diagram.
2. An inductive coil takes 10A and dissipates 1000W when connected to a 230V, 50Hz, 1ΦAC supply. Calculate:
    a) Impedance
    b) Effective resistance
    c) Reactance
    d) Inductance
    e) Power factor
    f) Draw phasor diagram
3. Define RMS value and prove that: $I_{rms}=\frac{I_m}{\sqrt{2}}$
4. A coil of resistance 20Ω and inductance 0.5H is connected in series with a capacitor of capacitance 5.0μF across a 230V, 50Hz, 1ph AC supply. Find
    1) Total impedance of the circuit
    2) Total current taken by circuit
    3) Phase difference between voltage and current
5. Derive an expression for current when pure capacitor is connected across an alternating voltage. Draw waveform and phasor diagram. Also derive the expression for power and comment on average power.
6. A resistance of 50Ω, an inductance of 0.1H and a capacitance of 50μF are connected in series across a 230V, 50Hz supply. Calculate a) the value of impedance b) current flowing c) power factor d) power consumed.
7. Derive the vector relationship between voltage and current for a series R-L circuit. Draw necessary phasor diagram.
8. A resistance of 50Ω and a capacitor of 100 μF are connected in series. The supply voltage to the circuit is 200V at 50Hz. Calculate the voltage across the resistor and capacitor. Also calculate current and power factor.

Unit 4

1. Derive the relationship between phase voltage & line voltage, phase current and line current for a balanced 3ph delta connected system. Draw phasor diagram.
2. A 400V, 3 phase supply is connected across a balance load of three resistances each of a 40Ω resistance. Determine the current drawn from the power mains, if the three resistances are connected in a) star and b) delta.
3. What are the advantages of three phase AC supply system over single-phase AC supply system?
4. Three equal impedances each of (5+j8) Ω are connected in star across 3 phase 400V, 50Hz AC supply. Calculate
   1) Line current 2) Active power 3) Reactive power 4) Apparent power
5. Derive the relationship between phase voltage and line voltage, phase current and line current for a balanced 3 phase star connected system. Draw phasor diagram.
6. A three-phase load has 4Ω resistance and an 8Ω inductive reactance in each branch. It is connected to a 400V, 4 wire, 3-phase supply. Determine the power absorbed by the load if the three impedances are connected in a) star and b) delta.
7. Derive the relationship between phase voltage & line voltage, phase current and line current for a balanced 3ph delta connected system. Draw phasor diagram.
8. A balance three phase load consists of three coils, each of 4Ω resistance and 0.02H inductance. Determine the total active power when the coils are (a) star connected, (b) delta connected to a 3-phase 415V, 50Hz, Ac supply.

Unit 5

1. Explain construction and working of a single-phase transformer.
2. Derive the torque equation of DC motor.
3. Explain the operation of single-phase transformer on resistive load. Also draw the phasor diagram.
4. Explain the following D.C. motors with their salient features:
   1) D. C. shunt motor 2) D. C. series motor
5. Derive the EMF equation of single-phase transformer.
6. Explain with neat sketch construction of D.C motor.
7. Explain the operation of single-phase transformer on inductive load. Also draw the phasor diagram.
8. Draw the diagram of DC shunt motor and explain its characteristics.

Unit 6

1. Explain construction and working of Electrodynamometer type wattmeter.
2. What is the need of earthing?
3. Explain the construction and working of moving iron attraction type instrument with neat diagram.
4. Explain pipe type earthing scheme with necessary diagram.
5. Explain the construction and working of moving iron repulsion type instrument with neat diagram.
6. What are the safety precautions need to be taken while handling the electrical apparatus.
7. Explain construction and working of Energy Meter.
8. Explain plate type earthing scheme with necessary diagram.