17214

3 Hours / 100 Marks   Seat No.

Instructions : (1) All Questions are *compulsory*.

(2) Answer each next main Question on a new page.

(3) Illustrate your answers with neat sketches wherever necessary.

(4) Assume suitable data, if necessary.

(5) Use of Non-Programmable Electronic Pocket Calculator is permissible.

Marks

1. **Attempt any TEN of the following :**   **20**

   (a) Give relation between resistance and resistivity. State SI unit of both.

   (b) Two resistances of 10 Ω each are connected in parallel. Find the equivalent resistance.

   (c) Write any four application of heating effect of electric current.

   (d) Define unilateral and bilateral circuit.

   (e) Write two uses of Electrolytic capacitor.

   (f) Define MMF and give its SI unit.

   (g) State the values for permeability of free space and relative permeability of air.

   (h) List two types of induced emf.

   (i) Give meaning of CRGO and HRGO silicon steel.

   (j) Differentiate between two types of statically induced emf.

   (k) State the meaning of 'A' and 'B' type insulating materials.

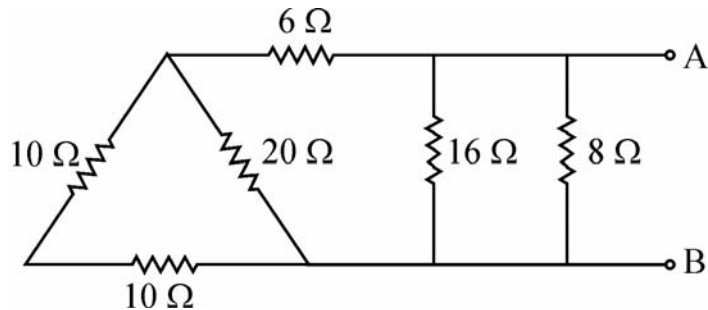   (l) Define frequency for a sine wave. Give SI unit.

2. **Attempt any FOUR of the following :**   **16**

   (a) An immersion heater is rated as 250 V, 1000 W. Calculate resistance and current through it. Determine the bill for using it for 10 hours at a rate of ₹ 2 per unit.

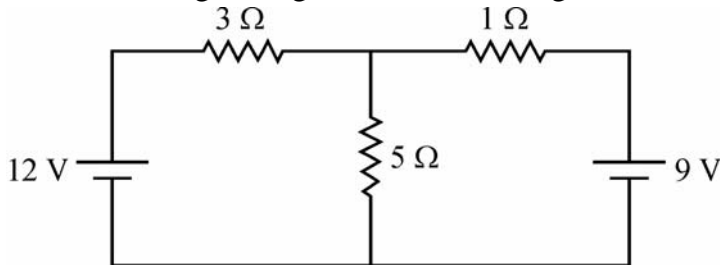   (b) List any four types of resistors. Give one application of each.

P.T.O.

(c) Calculate resistance R_{AB} of Fig.-1.

Fig. – 1

(d) Define the terms –

(i) Node (ii) Branch (iii) Loop (iv) Mesh

(e) Find current flowing through 5Ω resistor using Kirchhoff's laws at Fig.-2.

Fig. – 2

(f) Give any four comparisons between electric circuit and magnetic circuit.

3. **Attempt any FOUR of the following :** **16**

(a) The parallel plates of a capacitor each of 460 cm^2 area are separated by a distance of 2.2 mm using a dielectric material of permitivity 4.5. Calculate the capacitance and charge on each plate if voltage across plates is 415 volts.

(b) Define the terms –

(i) Breakdown voltage (ii) Dielectric strength. State any four factors which affect the dielectric strength.

(c) Compare dry cell and lead-acid battery on the basis of principle of operation, maintenance, life, cost.

(d) State the relation for energy stored in a capacitor.

A capacitor of 850 μF is charged to a voltage of 120 V. Calculate the energy stored by the capacitor.

(e) Define –

(i) Magnetic field strength

(ii) Magnetic flux density

(iii) Permeability

Give relation between them.

(f)   Find the equivalent capacitance C_{AB} of Fig.-3. (All values are in µF)
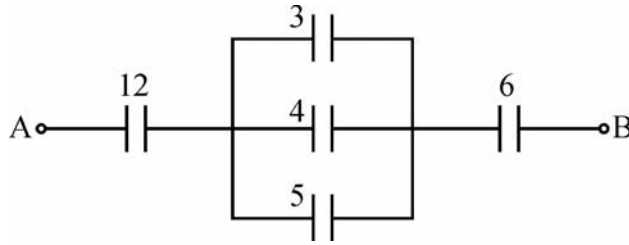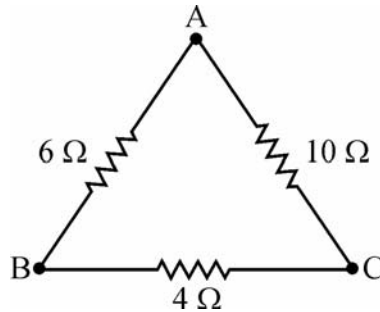

Fig. – 3

4.   **Attempt any FOUR of the following :**   16

(a)   Convert the network of Fig.-4 into equivalent star network.

Fig. – 4

(b)   Describe the concept of magnetic hysterisis and hysterisis loss.

(c)   List any four conducting materials and give one application of each in electrical equipments or machines.

(d)   An iron ring with mean length of 60 cm is uniformly wound with 250 turns of wire. Calculate the value of flux density if a current of 2A flows through the wire.

Assume $\mu_r = 500$ for iron.

(e)   Draw circuit for ideal and practical voltage source. Convert a 20 V voltage source with 2.5 Ω internal resistance into equivalent current source.

(f)   Give four applications each of

(i)   Permanent magnet

(ii)   Electromagnet

5. **Attempt any FOUR of the following :** 16

    (a) State and explain Faraday's laws of electromagnetic induction.

    (b) Compare series and parallel connection of resistances (4 points).

    (c) Describe the laws for finding direction of induced emf.

    (d) A field winding has a resistance of 220 Ω at 25 °C. Find the resistance of the winding at (i) 0 °C and (ii) 50 °C. Take $\alpha_0 = 0.004/°C$.

    (e) Define – (i) self inductance (ii) mutual inductance (iii) co-efficient of coupling. State relation for coefficient of coupling.

    (f) A conductor of 1.5 m length moves right angle to a uniform magnetic field of flux density 1.2 T with a velocity of 100 m/s. Calculate the value of induced emf in the conductor. If the conductor moves at an angle of 30° with the direction of field. Calculate the value of induced emf.

6. **Attempt any FOUR of the following :** 16

    (a) State and explain KCL.

    (b) List the number of steps to be carried out for maintenance of Lead-acid batteries.

    (c) With the help of neat sketch explain how sinusoidal emf is generated using simple loop AC generator.

    (d) Classify insulating materials on the basis of state of material. Give two examples of each.

    (e) Describe the necessity of series connection and parallel connection of batteries.

    (f) Distinguish between paramagnetic and ferromagnetic materials on any four points.

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