12425

3 Hours / 70 Marks   Seat No. ☐☐☐☐☐☐☐☐

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

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

(3)   Figures to the right indicate full marks.

(4)   Assume suitable data, if necessary.

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

Marks

1.   **Attempt any FIVE of the following :**   **10**

(a)   Define the term :

(i)   Magnetic flux

(ii)   Permeability

(b)   State four merits of 3ϕ system over 1ϕ system.

(c)   State the working principle of stepper motor.

(d)   Write any four main parts of dc motor.

(e)   List any two factors that effect on earth resistance.

(f)   State the emf equation of transformer.

(g)   State the relationship between line and phase value of voltage and current for 3ϕ star connection.

2. **Attempt any THREE of the following :** **12**

(a) Explain Faraday's laws of electromagnetic induction.

(b) Compare Series and parallel magnetic circuit.

(c) What is the working principle of an isolation transformer ? Draw its symbol. State any two applications.

(d) Define the term :

(i) Voltage ratio

(ii) Current ratio

(iii) Transformation ratio

(iv) Turns ratio related to single phase transformer

3. **Attempt any THREE of the following :** **12**

(a) State any four electrical general safety rules you need to follow in the electrical laboratory.

(b) State the working principle of a linear induction motor. Give two applications.

(c) If $V = 50\sqrt{2} \sin wt$ volt and $i = 10\sqrt{2} \sin (wt = 30)$ amps. Draw phasor diagram for the above two quantities. State which quantity is lagging and the phase difference.

(d) For a purely inductive circuit :

(i) Draw a neat sketch with a sinusoidal voltage and mark all voltages and current.

(ii) Draw waveform obtained for current flowing in the circuit and applied voltage.

(iii) Draw phasor diagram and write voltage and current equations for the above circuit.

4. **Attempt any THREE of the following :** 12

   (a) Draw a balanced 3 phase delta connected load. Show various line and phase quantities. Write the relationship between the voltages and current for line and phase values.

   (b) Compare auto-transformer and two winding transformer on the basis of

      (i) Symbol

      (ii) Number of windings

      (iii) Copper saving

      (iv) Application

   (c) Draw schematic representation of

      (i) DC shunt motor

      (ii) DC series motor

      and state any 2 applications for both.

   (d) Explain the working of a single phase transformer with neat diagram.

   (e) State need of earthing. List out types of earthing.

5. **Attempt any TWO of the following :** 12

   (a) An alternating voltage is represented by $V = 50.5 \sin(314t + 90)°$. Calculate frequency, amplitude, RMS value, average value, phase difference and angular frequency.

   (b) Describe construction and working principle of universal motor. Give its application.

   (c) Explain with neat diagram, operation of ELCB and give two applications.

6.   **Attempt any TWO of the following :**   12

   (a)   State types of single phase induction motor. Explain split phase motor with neat diagram. Also write any two applications.

   (b)   For the phasor diagram shown below find :

      (1)   Impedance

      (2)   Power factor and Nature of P.F.

      (3)   Total Power

      (4)   Value of components connected in series (f = 50 Hz)

$$I = 2.5\ A$$

$$30°$$

$$V = 120\ V$$
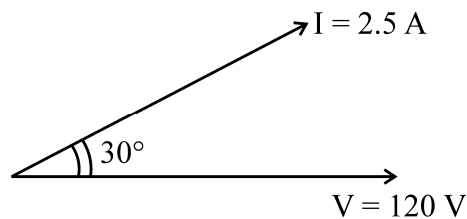
   (c)   An iron ring has a cross-sectional area of 400 mm^2 and a mean diameter of 25 cm. It is wound with 500 turns. If the relative permeability is 250, find the total flux set up in the ring. The coil resistance is 474 Ω and the supply voltage across the coil is 20 V.

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