11718

3 Hours / 100 Marks   Seat No. ☐☐☐☐☐☐☐

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

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

(3) Assume suitable data, if necessary.

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

(5) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

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

   (a) Define form factor and peak factor.

   (b) Write any two difference points between a.c. and d.c. supply.

   (c) Draw the voltage waveform of three phase a.c. supply for 0 to 2π.

   (d) State the concept of phase sequence.

   (e) State the Faraday's law of electromagnetic induction.

   (f) State Lenz's law.

   (g) Define transformation ratio and voltage ratio of transformer.

   (h) What is the main purpose of using isolation transformer in electronic circuits ?

   (i) Mention any two methods to control speed of 3ϕ I.M.

   (j) Define synchronous speed and slip of 3ϕ I.M.

   (k) Write down any two applications of servo motor.

   (l) State specialty of universal motor.

   (m) State the importance of ELCB in circuit.

   (n) List any four tools used for safety in workshop.

2. Attempt any FOUR : 16

(a) $V = 200 \sin \left(314\, t + \dfrac{\pi}{3}\right)$. Determine :

    (i) Frequency   (ii) V_{rms}

    (iii) V_{avg} (iv) Phase angle

(b) Draw the waveform and phasor diagram for current and voltage when a.c. flows through a purely capacitive circuit. Also write equation for voltage and current.

(c) A coil of resistance 10 Ω and inductance 0.01 H are connected in series with 100 µF capacitor across 230 V, 50 Hz a.c. supply. Find :

    (i) X_L (ii) X_C

    (iii) Z   (iv) I

(d) Draw the phasor diagram of R-L-C series circuit when

    (i) $X_L > X_C$ (ii) $X_L = X_C$ (iii) $X_L < X_C$

(e) A series R-L circuit takes a current of 2 A when connected to 200 V, 50 Hz a.c. supply and consumes 300 watts. Calculate resistance, inductance, impedance and power factor.

(f) For below shown phasor diagram of R-L-C series circuit find (i) Impedance (ii) Power factor (iii) Power consumed (iv) Nature of circuit
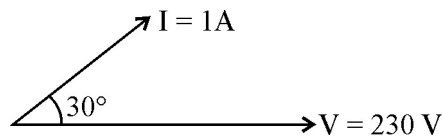
3. **Attempt any FOUR :** 16

   (a) Draw the power triangle and define active power, reactive power and apparent power.

   (b) Give the significance of power factor. Write down the power factor for purely inductive, capacitive and resistive circuit.

   (c) State the condition for resonance. Write about the value of current during series resonance. Show the graphical representation of current in series resonance circuit.

   (d) Define resonant frequency and Q-factor. Give relation of each.

   (e) List the advantages of 3ϕ supply over single phase (any four).

   (f) Give relation between line and phase current, line and phase voltage for 3ϕ balanced (i) Star connected and (ii) Delta connected load.

4. **Attempt any FOUR :** 16

   (a) Three impedances of $(4 + 3j)$ ohms each are connected in star to a 3ϕ, 440 V, 50 Hz balance a.c. supply. Calculate line voltage, phase voltages, line current phase current, power factor and power.

   (b) Draw delta connected 3ϕ load and show line and phase voltages and current on it.

   (c) Explain self induced emf, mutually induced emf and dynamically induced emf.

   (d) State Fleming's right hand rule and write down formula for energy stored in magnetic field.

   (e) Define regulation and efficiency of transformer. Which transformer will be said to be a quality transformer one with regulation 2% or the other with regulation 4% ?

   (f) Write down one application of each transformer :

   (i) Audio freq.   (ii) Radio freq.

   (iii) Intermediate freq.   (iv) Pulse transformer

5. **Attempt any FOUR :** 16

   (a) A 1.5 kVA, 230/110 V, 50 Hz single phase transformer has 80 turns on secondary winding. Calculate number of primary turns full load primary and secondary currents.

   (b) State the emf equation of a single phase transformer. Write meaning of each term.

   (c) Can auto transformer be used as step up and step down transformer ? If yes, show the circuits.

   (d) Explain the working principle of 3ϕ I.M.

   (e) Draw the torque-speed characteristics of 3ϕ I.M. Explain about the nature.

   (f) Define synchronous speed. Write down the formulas for slip, slip speed, rotor frequency.

6. **Attempt any FOUR :** 16

   (a) Explain the speed control method of 3ϕ I.M. using variable frequency drive using thyristor.

   (b) Write down the constructional difference between squirrel cage and slip ring 3ϕ I.M.

   (c) Explain the working principle of stepper motor. Mention its types. Write any two applications.

   (d) State the working principle of a.c. servo motor and draw its torque speed characteristics.

   (e) Give the necessity of earthing. State the range of voltage between earth and neutral of healthy wiring.

   (f) Write advantages of MCCB over fuse (any four).

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