

17318

15116

3 Hours / 100 Marks

Seat No.

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

Marks

1. (A) Attempt any SIX of the following :

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- (a) Define peak factor and form factor for a sinusoidal quantity.
- (b) State Fleming's Right Hand Rule.
- (c) List the various losses that occur in a transformer.
- (d) Why transformer rating is in kVA and not in kW ? Explain.
- (e) List two applications of universal motor.
- (f) State necessity of earthing.
- (g) For star connected load, state numerical relationship between
 - (i) Line current and Phase current.
 - (ii) Line voltage and Phase voltage.
- (h) Define : Phase sequence and unbalanced load.

(B) Attempt any TWO of the following :

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- (a) With the help of waveforms and phasor diagrams show the phase relationship between voltage and current in pure inductive and pure capacitive circuits.
- (b) Write four advantages of 3-phase system over 1-phase system.
- (c) Draw the schematic representation and state the principle of working of servo motor.

P.T.O.

2. Attempt any FOUR of the following : 16

- (a) What is leading and lagging phase difference ? Show it by waveforms.
- (b) Draw a RC circuit and its vector diagram. Write its voltage and current equations.
- (c) Compare core type and shell type single phase transformer (any four points).
- (d) Draw a delta connection for 3-phase power supply and show line current, line voltage, phase current and phase voltage on it and state the relation between currents and voltages (phase values and line values).
- (e) Define :
 - (i) RMS value
 - (ii) Instantaneous value
 - (iii) Angular frequency
 - (iv) Phase angle with reference to AC quantities
- (f) Explain the resonance in R-L-C series circuit.

3. Attempt any FOUR of the following : 16

- (a) Explain the generation of single phase AC by an elementary alternator.
- (b) Draw a R-L-C series circuit and phasor diagram. Also write equations.
- (c) A coil has a resistance of 3 ohm and inductance of 0.012739 Henry and is connected across 230 volts, 50 Hz AC supply. Calculate :
 - (i) Inductive reactance
 - (ii) Impedance
 - (iii) Current
 - (iv) Power factor
- (d) State and explain Lenz's law.
- (e) Explain the statically induced emf and dynamically induced emf.
- (f) Explain the working principle of 3-phase induction motor.

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

- (a) An alternating voltage is mathematically expressed as

$$v = 141.42 \sin \left(157.08 t + \frac{\pi}{12} \right) \text{ volt.}$$

Find maximum value, RMS value, frequency and periodic time.

- (b) Compare auto-transformer and two winding transformer. (any four points)
- (c) Draw and explain torque-speed characteristics of 3-phase I.M.
- (d) Explain construction of 3-phase I.M. with diagram.
- (e) List out speed control methods for 3-phase induction motor. Explain any one in brief.
- (f) Draw the schematic representation and state the principle of working of split phase single phase induction motor.

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

- (a) A resistance of 10 ohm, inductance of 0.1 H and capacitance of 100 microfarad are connected in series across 100 volts, 50 Hz, AC supply.

Find : (i) current (ii) power factor
(iii) power (iv) draw phasor diagram.

- (b) Three identical coils each having a resistance of 15 ohm and an inductance of 0.03 H are in delta across 400 V, 50 Hz supply. Determine (i) impedance per phase (ii) phase current (iii) line current (iv) power consumed.
- (c) A 200 kVA, 3300/240 V, 50 Hz single phase transformer has 80 turns on secondary winding. Calculate (i) Primary current and secondary current on full load. (ii) Maximum value of flux (iii) Number of primary winding turns.
- (d) Compare squirrel cage and slip ring induction motor on the basis of :
(i) rotor construction (ii) starting torque
(iii) efficiency (iv) application.
- (e) Explain in brief constructional detail of slip ring induction motor.
- (f) Write four applications of stepper motor.

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

- (a) Three impedances each of 3 ohm resistance and 4 ohm inductive reactance in series are connected in star across 3-phase, 400 V, 50 Hz, AC supply. Determine :
- (i) Phase current (ii) Line current
(iii) Power factor (iv) Total power.
- (b) A 100 kVA, single phase transformer has a full load Cu loss of 3 kW and iron loss of 2 kW. Find the efficiency of the transformer at half and full load at unity power factor.
- (c) A single phase transformer delivers 10 A at 220 V to a resistive load while the primary draws 6 A at 0.9 lagging power factor from 450 V, 50 Hz supply. The turns ratio of the transformer is 2. Calculate the percentage efficiency and percentage regulation in this condition.
- (d) Explain the principle of working of universal motor.
- (e) Draw and explain working of megger.
- (f) What is ELCB and MCCB ? State its function.
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