

22221

11819

3 Hours / 70 Marks

Seat No.

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- 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) Figures to the right indicate full marks.
 - (5) Assume suitable data, if necessary.
 - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.

Marks

1. **Attempt any FIVE of the following :** **10**
 - (a) State Faraday's laws of Electromagnetic induction.
 - (b) Define : (i) Amplitude (ii) Cycle with reference to AC waveform.
 - (c) Define : (i) Phase (ii) Phase Difference.
 - (d) Define : (i) Phase Voltage (ii) Line Voltage with reference to polyphase A.C. circuits.
 - (e) State how to reverse the rotation of 3-phase induction motor.
 - (f) State any two applications of DC servomotor.
 - (g) State the principle of operation of ELCB.

2. **Attempt any THREE of the following :** **12**
 - (a) Compare electric circuit with magnetic circuit on the basis of any two similarities and any two differences.
 - (b) Draw neat waveforms and explain the concept of lagging and leading quantity.
 - (c) Derive the emf equation of single-phase transformer.
 - (d) Draw neat circuit diagrams and describe the methods of speed control of D.C. Shunt motor.

- 3. Attempt any THREE of the following : 12**
- (a) Explain the concept of Dynamically induced emf and Statically induced emf.
 - (b) Draw schematic diagram of elementary 3-phase generator and describe its operation in brief. Draw waveform of 3-phase emfs.
 - (c) Compare Squirrel Cage Induction Motor and Slip Ring Induction Motor on the basis of any four points.
 - (d) State types of fuses and describe the operation of fuse.
- 4. Attempt any THREE of the following : 12**
- (a) Draw hysteresis loop and define :
 - (i) Magnetic hysteresis and (ii) Hysteresis loss.
 - (b) Draw constructional sketch of DC motor and state basic motor principle.
 - (c) Explain the working of three-phase induction motor.
 - (d) Explain the basic principle of operation of Brushless D.C. motor.
 - (e) Describe the operation of MCCB.
- 5. Attempt any TWO of the following : 12**
- (a) A sinusoidal voltage $v = 200 \sin (314.2t)$ volt is applied across a resistance of 50Ω .
Determine :
 - (i) Peak current I_p
 - (ii) Average value of current
 - (iii) RMS current I_{RMS}
 - (iv) Frequency of current
 - (v) Angular frequency of current
 - (vi) Equation for instantaneous value of current.
 - (b) Three identical impedances, each having resistance of 20Ω and capacitance of $20 \mu F$ in series, are connected in star to the 3-phase, 415 volt, 50 Hz supply. Determine : (i) Capacitive reactance, (ii) Impedance per phase (iii) Phase voltage (iv) Phase current (v) Power factor (vi) Total 3-phase power consumed by the load.
 - (c) State types of stepper motor. Draw a neat sketch and describe working of any one type of stepper motor. State any two applications of stepper motor.

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

- (a) A series R-L circuit, consisting of a resistance of 100Ω and an inductance of 0.6 H , is connected to 230 V , 50 Hz supply mains.

Determine :

- (i) Inductive reactance
 - (ii) Circuit impedance
 - (iii) Circuit current
 - (iv) Circuit power factor
 - (v) Power consumed by the circuit
 - (vi) Reactive power
- (b) State any two applications of following each motor. Describe the reason of using these motors in their respective applications.
- (i) Shaded Pole Induction Motor
 - (ii) Universal Motor
 - (iii) AC Servo Motor
- (c) Describe the necessity of earthing and explain the methods of reducing earth resistance.
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