

Electrical Engineering

S.Y. Diploma : Sem. III

[EJ/EN/ET/EX/DE/IS/IC/IE/EV/MU]

Time: 3 Hrs.]

Prelim Question Paper

[Marks : 100

- 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) Figure to the **right** indicate **full** marks.
 - (5) Assume suitable data, if **necessary**.
 - (6) Use of Non-programmable Electronic Pocket Calculator is **permissible**.
 - (7) Mobile Phone, Pager and any other Electronic Communication devices are **not** permissible in Examination Hall.

1. Attempt any **TEN** of the following. [20]

- (a) State E.M.F. equation of transformer and write meaning of each term in the formula.
- (b) Why should a transformer be never connected to DC supply.
- (c) Draw the voltage waveform of three phase AC supply for 0 to 2π .
- (d) List the various losses that occur in a transformer.
- (e) State the Faraday's law of electromagnetic induction.
- (f) Define RMS value and Average value of an electrical quantity.
- (g) State the expansion of the terms : (i) MCCB (ii) ELCB.
- (h) Define phase sequence in 3 phase a.c. supply.
- (i) State the types of earthing.
- (j) Write the equation of V and I in pure capacitive circuit.
- (k) List speed control methods for three phase I.M.
- (l) List two applications of universal motor.

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

- (a) What are the advantages of three-phase system over single-phase system?
- (b) An alternating current given by equation $i = 142.14 \sin 628t$. Find:
 - (i) RMS value
 - (ii) Average value
 - (iii) Frequency
 - (iv) Time period
- (c) With the help of waveforms and phasor diagrams show the phase relationship between voltage and current in pure inductive and pure capacitive circuits.
- (d) Compare core type and shell type single phase transformer (any four points).
- (e) Balanced star connected load supplied from three phase 415 V, 50 Hz system, current in each phase is $20 \angle -30^\circ$, 30° being w.r.t. phase voltage. Determine :
 - (i) V_{ph}
 - (ii) IL
 - (iii) $\cos \phi$
 - (iv) Power

3. Attempt any **FOUR** of the following : [16]
- (a) The coil having a resistance of 10Ω and an inductance of 0.2 Henry is connected to a 100 V, 50 Hz supply.
Calculate :
 - (i) the impedance of the coil
 - (ii) the reactance of the coil.
 - (iii) the current drawn and
 - (iv) the phase difference between the current and the applied voltage
 - (b) Explain the difference between statically induced emf. and dynamically induced emf.
 - (c) Draw a R-L-C series circuit and phasor diagram. Also write equations.
 - (d) What are the different types of power in AC circuit? State its formula.
 - (e) Why transformer rating in terms of KVA not in kW?
4. Attempt any **FOUR** of the following : [16]
- (a) Draw and explain torque-speed characteristics of 3-phase I.M.
 - (b) Compare auto-transformer and two winding transformer. (any four points)
 - (c) Define :
 - (i) Slip (ii) Rotor frequency (iii) Synchronous (iv) Slip speed
 - (d) Compare three phase squirrel cage induction motor and slip ring induction motor based on starting torque, starting current, power factor and maintenance cost.
 - (e) State the principle of operation of an universal motor. Give any two applications.
5. Attempt any **FOUR** of the following : [16]
- (a) A single phase transformer has 350 primary and 1050 secondary turns. The net cross-sectional area of core is 55 cm^2 . If primary winding is connected to a 400 V, 50 Hz, 1-phase supply. Calculate.
 - (i) Maximum value of flux density in the core.
 - (ii) Voltage induced in the secondary.
 - (b) Three identical coils each of impedances $(4.2 + j5.6)\Omega$ are connected in delta across 415 V, 50 Hz three phase power supply. Determine
 - (i) V_{ph} (ii) I_{ph}
 - (iii) Power factor (iv) Power absorbed by each coil
 - (c) 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.

- (d) 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.
- (e) Draw the schematic representation and state the principle of working of split phase single phase induction motor.

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

[16]

- (a) Write four applications of stepper motor.
- (b) Define fuse. State the necessity of fuse. Write rating of fuses used in labs and mention the classification of fuses.
- (c) State specifications and two applications of isolation transformer and radio-frequency transformer.
- (d) Draw and explain working of megger.
- (e) Draw the schematic representation and state the principle of working of servo motor.

□ □ □ □ □