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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/MANAGEMENT/ COMMERCIAL PRACTICE, APRIL – 2024

FUNDAMENTALS OF AC SYSTEMS

[Maximum Marks : 100] [Time : 3 hours]

PART – A
(Maximum Marks : 10)

Marks

I. Answer **all** questions in one or two sentences. Each question carries 2 marks.

1. Define RMS value of an alternating current.
2. Write the condition for series RLC AC circuit.
3. Mention the methods of interconnection in a three phase system.
4. Define phase sequence.
5. List two methods for power measurement in three phase circuits. (5x2=10)

PART – B
(Maximum Marks : 30)

II. Answer any **five** of the following questions. Each question carries 6 marks.

1. An AC voltage is given by v = 325 sin 377t. Find (a) RMS value (b) Frequency (c) Maximum value of voltage.
2. Explain AC through RL series circuit with relevant vector diagrams.
3. Define admittance, conductance and susceptance in AC circuit.
4. Compare star and delta connections.
5. Three impedances each of 10Ω resistance and 5Ω inductive reactance are connected in delta to a 400V three phase supply. Determine (i) line current (ii) power factor (iii) total power.
6. Explain the disadvantages of low power factor.
7. Explain power factor in leading and lagging loads with waveforms and vector diagrams. (5x6=30)

PART – C
(Maximum Marks : 60)
(Answer **one full** question from each unit. Each full question carries 15 marks)

UNIT – I

III. (a) Define the terms: (i) Average value (ii) Amplitude (iii) Crest factor (iv) Form factor of a sinusoidal AC voltage waveform. (8)

(b) A 50Hz Sinusoidal voltage has a maximum value of 325V. Find the value of voltage 0.0025 seconds after passing through maximum positive value. At what time measured from a positive maximum value will instantaneous voltage be 150V. (7)

OR

IV. (a) Derive the equations of sinusoidal alternating voltage and current. (8)

(b) Explain the advantages of AC supply system. (7)

UNIT – II

V. (a) A resistance of 10Ω, inductance of 1H and a capacitance of 10μF are connected in series across a 50V, 50Hz AC supply. Find the total impedance, current and phase angle. (8)

(b) Explain alternating current through RLC series circuit with relevant vector diagrams for voltage vectors and impedance vectors. (7)

OR

VI. (a) An inductive coil has a resistance of 10Ω and inductance of 0.146H is connected to a supply at 250V, 25Hz. Calculate (i) Inductive reactance (ii) Impedance (iii) Current through the coil (iv) Power factor. (8)

(b) Explain alternating current through RL parallel circuit with relevant vector diagram. (7)

UNIT –III

VII. (a) Three resistances of 20Ω each are connected in star across 400V, 3-phase supply. Calculate (i) Phase voltage (ii) Line current (iii) power factor (iv) Total active power taken. (8)

(b) Explain the generation of Polyphase voltages. (7)

OR

VIII. (a) Three identical coils connected in delta to a 440V 3phase supply takes a total of 50kW and line current of 90A. Find (a) phase current (b) power factor (c) reactive power consumed by the coil (d) total kVA taken by the coil. (8)

(b) Explain the advantages of three phase system. (7)

UNIT – IV

IX. (a) A 500V, 3 phase motor has an output of 50HP operates at a power factor of 0.85 with an efficiency of 90%. Find input power and line current. Calculate the readings on each of two watt meters connected to measure the input. (8)

(b) Explain the principle of power factor improvement. Briefly explain any two power factor improving methods. (7)

OR

X. (a) While performing a load test on a three phase induction motor by using two wattmeter method, the readings obtained on two watt meters were 12.5kW and -4.8kW and the line voltage was 440V. Find (i) active power (ii) reactive power (iii) power factor (iv) line current. (8)

(b) Explain active power measurement using **one watt meter** of a three phase **three wire** system. (7)

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