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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/
MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER-2020

FUNDAMENTALS OF AC SYSTEMS

[Maximum marks: 75] (Time: 2.15 Hours)

PART – A

(Answer any ***three*** questions in one or two sentences. Each question carries 2 marks)

I. (1). Define cycle and frequency in an ac system.

(2). Write the expression for capacitive reactance (*Xc*).

(3). What are the general methods used for interconnection of three phase.

(4). What are the methods used for 3-phase power measurements.

(5). Differentiate between balanced load and unbalanced load. (3 x 2 = 6)

PART – B

(Answer any ***four*** of the following questions. Each question carries 6 marks)

II. (1). Explain average value and formulate $I_{avg} = 0.637 I_m$

(2). Develop voltage equation $e = E_m \mathrm{Sin}\, wt$ with a neat figure.

(3). Draw and explain AC through pure inductance circuit.

(4). List the advantages of poly phase system over single phase system.

(5). Express delta to star conversion.

(6). Explain three watt meter method in 3-phase power measurements with neat figure.

(7). List the disadvantages of poor power factor. (4 x 6= 24)

PART – C

(Answer ***any of the three units*** from the following. Each question carries 15 marks)

UNIT –I

III. (a). Define the following terms in an AC system.

(i). Alternating current. (ii). Instantaneous value.

(iii). Form factor. (iv). Angular velocity. (8)

(b). Two alternating quantities are represented as $A = 5 \angle 30^0$ and $B = 8 \angle -30^0$.

Perform the following operation and express final result in the polar form.

(i). A + B (ii). A x B (7)

OR

IV. (a). Define the following terms.

(i). Phase. (ii). Phase difference. (iii). RMS value. (iv). Maximum value. (8)

(b). A sinusoidal 50Hz a.c has a maximum current of 25 A. Find average value, rms value, from factor and instantaneous value of current at $\frac{1}{600}$ s (7)

UNIT-II

V. (a). Derive equation for impedance, current, power factor, phase angle and power for RLC series circuit with relevant vector diagram. (8)

(b). A resistance of 20 Ω, and inductance of 0.2H and a capacitance of 100 μ F are connected in series across 220V, 50 Hz supply. Determine i). Impedance (ii). Current (iii). Voltage across, R, L, C (iv) p.f. (v) power in watts. (7)

OR

VI. (a). Explain resonance and Q factor in RLC series circuit. (8)

(b). A coil having an inductance of 50mH and resistance of 10 Ω is connected in series with a 25 μ F capacitor across 200 V ac supply. Calculate (i). Resonance frequency (ii) current flowing at resonance iii) Q factor. (7)

UNIT-III

VII. (a). Prove the relation between line voltage and phase voltage, line current and phase current and derive expression for power in star connected system. (8)

(b). Three similar coils, each having a resistance of 20 Ω and inductance of 0.05 H are connected in (i). Star (ii). Delta to a 3-phase, 50Hz supply with 400V between lines. Calculate the total power absorbed and the line current in each case. (7)

OR

VIII. (a). Compare star and delta system. (8)

(b). Three impedances of 20 Ω, 50 Ω, 30 Ω are connected in delta. Find out their three equivalent star connected impedances. (7)

UNIT-IV

IX. (a). Prove that $P_R+P_Y+P_B = W_1 + W_2$ in a 3-phase system. (8)

(b). In a 3-phase 400V, 50Hz, 100 HP, delta connected motor power is measured using two wattmeters. The efficiency and p.f are 82% and 0.8 lag respectively. Determine wattmeter readings, line current and phase current. (7)

OR

X. (a). Mr.Libu installed a new 500kW machine in his factory. But his factory's pf decreased from 0.99 to 0.89. Suggest any two methods to improve the pf while operating the new machine in the factory. (8)

(b). A three phase load has a pf of 0.397 lagging. Two wattmeter connected to measure power, show the input as 30kW. Find the reading on each watt meter. (7)

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