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(REVISION — 2015)

Reg. No.....

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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE — OCTOBER, 2019

FUNDAMENTALS OF AC SYSTEMS

[*Time* : 3 hours

(Maximum marks : 100)

PART — A

(Maximum marks : 10)

Marks

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

1. Define average value of alternating current.
2. Define Q-factor of a coil.
3. Define electrical resonance condition of an AC series circuit.
4. What is phase sequence in a 3-phase system ?
5. Write any two advantages of two-wattmeter method 3-phase power measurement.

(5×2 = 10)

PART — B

(Maximum marks : 30)

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

1. Explain the advantages of AC system.
2. Describe the equation of alternating voltage.
3. In a R-L series circuit, applied voltage V = 220V at 50Hz, R=3.5Ω and L = 0.1H. Find the current through the circuit and power factor.
4. Differentiate between star connection and delta connection.
5. Describe AC through pure capacitor with relevant circuit and vector diagram.
6. Explain any two power factor correction equipments.
7. Explain reactive volt-ampere by using two wattmeters. (5×6 = 30)

Marks

PART — C

(Maximum marks : 60)

(Answer *one* full question from each unit. Each full question carries 15 marks.)

UNIT — I

III (a) Define RMS value and form factor and peak factor for alternating current. 6

(b) An alternating quantity is given by $i = 200\sin 628t$ find

(i) RMS value (ii) Average value (iii) Frequency (iv) Form factor

(v) Peak factor (vi) Instantaneous value at t = 2mSec 9

OR

IV (a) A moving coil ammeter, a hot-wire ammeter and a resistance of 100Ω are connected in series with a rectifying device across a sinusoidal alternating supply of 200V. If the device has a resistance of 100Ω to the current in one direction and 500Ω to current in opposite direction, calculate the readings of the two ammeters. 8

(b) Explain the phasor representation of alternating quantities. 7

UNIT — II

V (a) Explain with relevant circuit diagram, waveform and vector diagram AC through a pure inductances. 7

(b) A resistance of 20Ω an inductance of 0.2H and a capacitance of 100μF are connected in series across 220V, 50Hz supply. Calculate the following :
(i) Impedance (ii) Current (iii) Power factor (iv) Power. 8

OR

VI (a) Explain with relevant circuit diagram, waveform and vector diagram AC through R - L series circuit. 7

(b) Two impedances $Z_1 = (6 + j8)\Omega$ and $Z_2 = (8 - j6)\Omega$ are connected in parallel. Calculate the branch currents, total current taken from the supply and its total power, if the supply voltage is 200V, 50Hz. 8

UNIT — III

VII (a) Show that the line voltage is equal to $\sqrt{3}$ times the phase voltage in a star connected 3-phase system. 7

(b) A balanced star connected load of $(8 + j6)\Omega$ per phase is connected to a 3-phase, 400V, 50Hz supply.

Find (i) Line current (ii) Power factor (iii) Power (iv) Reactive power (v) Total KVA. 8

OR

Marks

VIII (a) Explain delta connection with relevant circuit diagram and vector diagram. 8

(b) Three identical impedances are connected in delta to a 3-phase supply of 400V. The line current is 35A and the total power taken from the supply is 15kW. Calculate the resistance and reactance values of each impedance. 7

UNIT — IV

IX (a) Describe two-wattmeter method of 3-phase power measurement for a balanced load with relevant circuit diagram, vector diagram. 9

(b) The power in a 3-phase circuit is measured by two wattmeters. If the total power is 100Kw, what will be the reading of each wattmeter when (i) Power factor is 0.66 (ii) For what power factor will one of the wattmeter read zero ? 6

OR

X (a) A star connected balanced load is supplied from a 3-phase balanced supply with a line voltage of 416V at a frequency of 50Hz. Each phase of the load consists of a resistance and a capacitor joined in series and the reading on two-wattmeters connected to measure the total power supplied are 1980W and 782W, both positive. Calculate power factor, line current and capacitance of each capacitor. 7

(b) Discuss the variations in wattmeter readings in two-wattmeter method of 3-phase power measurement under balanced load with lagging and leading power factor. 8