TED (15/19) - 3033
(REVISION-2015/19)

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Reg.No……
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DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, NOVEMBER - 2023

FUNDAMENTALS OF AC SYSTEMS

(Maximum Marks:100) (Time: 3 Hours)

PART - A
(Maximum Mark : 10)

Marks

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

1. Define alternating voltage.
2. Write the expression for impedance and draw the impedance triangle.
3. Mention the condition for resonance and write equation for resonance frequency in RLC series circuit.
4. Mention the possible phase sequences in a three phase system.
5. Define power factor. (5 x 2 = 10)

PART - B
(Maximum Mark: 30)

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

1. Mention the advantage of AC supply.
2. Prove that RMS value of an AC voltage is 0.707 times of the maximum voltage.
3. What is the reactance of a 50Hz AC circuit containing an inductor of 10H and a capacitor of 15μF connected in series.
4. What are the advantages of polyphase system over single-phase system.
5. Three impedances 20Ω, 30Ω, 50Ω are connected in delta. Find out their equivalent star connected impedances.
6. Describe single wattmeter method for power measurement with a neat figure.
7. Explain synchronous motor method for power factor correction.

(5 x 6 = 30)

PART – C

(Maximum mark: 60)

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

UNIT - I

III (a) Prove that instantaneous voltage $e=E_m \sin\theta$. (7)

(b) The value of instantaneous current, $i = 200 \sin\theta$. If the frequency is 25Hz, how much time will it take for the current to rise 75 ampere. (8)

OR

IV (a) Define average value of an AC quantity and prove that the average value of an AC current by multiplying the maximum current with the value of 0.637. (7)

(b) Perform the following operation:

i) $A + B$, ii) A-B iii) $A \times B$ iv) A÷B,

where $A=(12+j18)$ and $B=(3+j4)$ (8)

UNIT – II

V (a) Explain the effect of AC through pure inductance(L) (7)

(b) A 6Ω and an inductance 0.03 H is connected in series across 50V, 60Hz supply circuit. Find **(i)** current **(ii)** PF **(iii)** phase angle **(iv)** Power (8)

OR

VI (a) A resistance of 20Ω, an inductance of 0.20H and a capacitance of 20μ farad are connected in series across a 200V, 50Hz supply.

Calculate **(i)** impedance **(ii)** current **(iii)** PF **(iv)** power consumed (7)

(b) A coil of resistance 2Ω and inductance 0.01 H is connected in series with a capacitor across 100 V, the maximum current flows through the circuit at a frequency 50Hz. Find the following **(i)** capacitance **(ii)** voltage across capacitor **(iii)** Q factor (8)

UNIT – III

VII (a) Prove the relation between line voltage and phase voltage in a 3-phase star connection using vectors. (7)

(b) A balanced star connected load $12 + j9$ W per phase is connected to a 3-phase, 400 V supply. Find **(i)** Line current **(ii)** active power **(iii)** reactive power (8)

OR

VIII. (a) Derive the expression for delta to star transformation. (7)

(b) Three coils each with a resistance of 45Ω and inductance of 0.2 H are connected to a 415V, 50Hz, 3-phase supply in delta. Calculate **(i)** impedance **(ii)** current in each phase **(iii)** PF **(iv)** Total power consumed. (8)

UNIT – IV

IX. (a) Explain two wattmeter method for power measurement in an ac 3-phase circuit with circuit diagram. (7)

(b) The power input to a 1000V, 50 Hz, 3-phase star connected motor having an efficiency of 90% is measured by two wattmeter method which indicate 300kW and 100kW respectively. Calculate **(i)** input power **(ii)** PF **(iii)** line current **(iv)** HP output. (8)

OR

X. (a) Differentiate between balanced load and unbalanced load. (7)

(b) A three phase 400V, 50Hz, 100 HP delta connected induction motor is working at full load. Two watt-meters are used for power measurement. Calculate (i) wattmeter readings (ii) line current (iii) phase current. The efficiency of motor is 90% and pf is 0.9 lag. (8)

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