

C23-EE-303

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BOARD DIPLOMA EXAMINATION, (C-23)

OCTOBER/NOVEMBER-2024

DEEE – THIRD SEMESTER EXAMINATION

AC CIRCUITS AND TRANSFORMERS

Time: 3 Hours]

PART—A

3×10=30

[Total Marks: 80

Instructions : (1) Answer **all** questions.

- (2) Each question carries **three** marks.
- (3) Answers should be brief and straight to the point and shall not exceed five simple sentences.
- **1.** Derive the relation between number of poles, speed and frequency.
- A sinusoidal wave is represented by i = 42sin628t. Determine the (a) R.M.S value (b) Average value (c) Frequency.
- **3.** Perform the following operations and express the result in polor form : (a) $A \times B$ (b) A/B, where A = (6 + j8), B = (3 - j4)
- **4.** The voltage across a $1 \mu F$ capacitor is given by $v = 170 \sin 400t$. What is sinusoidal expression for current?
- **5.** Write the equations for instantaneous voltage and current in R-L series circuit.
- **6.** Write the relation between line voltage and a phase voltage in a 3-phase star connection and delta connection.

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- **7.** Three similar resistances are connected in star across three-phase supply. Write the equation for power.
- **8.** Write the difference between core and shell type transformers.
- **9.** Draw the vector diagram of a transformer on no load and mention all the parameters.
- **10.** What are the applications of auto transformer?

Instructions : (1) Answer *any* **five** questions.

- (2) Each question carries **ten** marks.
- (3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.
- **11.** A 15 Ω resistor and 200 μ F capacitor are connected in series to a 60V sinusoidal supply. The current of 3 A is flowing. Calculate (*a*) Voltage across capacitor and resistor, (*b*) the supply frequency and (*c*) phase angle between voltage and current.
- **12.** (a) Derive expression for resonance frequency f_r in a RLC series circuit.
 - (b) Derive an expression for Q-factor of RLC series circuit.
- **13.** Derive the formula for calculating 3 \u03c6 power and power factor from the readings of two wattmeters for measuring power in 3-phase circuit.
- **14.** A balanced 3-phase star connected load 150 kW takes a leading current 100 A with a line voltage 1100V, 50Hz. Find the circuit constants of the load per phase.

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- **15.** (*a*) Derive the emf equation of transformer.
 - (b) A 250V/3000V, 50Hz singlephase transformer has a maximum flux density of 1.2 Wb/m². If the emf induced per turn is 4 V, find the primary and secondary number of turns and the cross-sectional area of the core.
- **16.** A 100kVA, 1000V/100V, 50Hz single-phase transformer gave the following test results :

OC test : 1000V, 5A, 1000W on HV side.

SC Test : Primary voltage for full load current = 22 V, 1050W on HV side. Draw the equivalent circuit of a transformer referred to primary.

- **17.** Explain briefly the following parts of power transformer *(a)* Tank and cooling tube *(b)* Conservator tank *(c)* Transformer oil (e) Buchholz's relay with a neat diagram.
- **18.** Explain the load tap changer of a power transformer with neat diagram.



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