23136

C23-EE–303

23136

BOARD DIPLOMA EXAMINATION, (C-23)

OCTOBER/NOVEMBER—2024

DEEE – THIRD SEMESTER EXAMINATION

AC CIRCUITS AND TRANSFORMERS

Time : 3 Hours] [*Total Marks* : 80

PART—A 3×10=30

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.

2. A sinusoidal wave is represented by $i = 42\sin 628t$. 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.

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?

PART—B

10×5=50

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 μF 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 ϕ 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.

15. *(a)* Derive the emf equation of transformer.

(b) A 250V/3000V, 50Hz singlephase transformer has a maximum flux density of 1·2 Wb/m^2. 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.

★★★