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C16-EE–303

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BOARD DIPLOMA EXAMINATION, (C-16)

JUNE/JULY—2022

DEEE - THIRD SEMESTER EXAMINATION

ELECTRICAL CIRCUITS

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. State any three applications of potentiometer.

2. Write any three limitations of Ohm's law.

3. Find the equivalent star-connected resistance of a given delta-connected load with R_{AB} = 10 Ω, R_{BC} = 20 Ω, R_{CA} = 30 Ω.

4. Define ideal voltage source and ideal current source.

5. Define phase and phase difference of an AC quantity.

6. The current flowing through a pure inductor is 25A. Find the inductance and power consumption when the voltage applied is $V = 150 \sin 314t$ volts.

7. Define *Q* factor of series resonant circuit.

8. List the methods used to solve parallel AC circuits.

9. Define polyphase circuit and phase sequence of polyphase circuit.

10. State any three advantages of 3-phase system over single-phase system.

PART—B

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

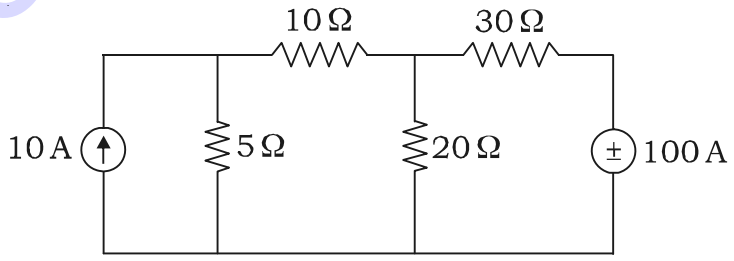
(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. Explain the construction and working of Megger with sketch. 10

12. A Wheatstone bridge *ABCD* is arranged as follows : *AB* = 2 Ω; *BC* = 3 Ω; *CD* = 4 Ω; *DA* = 5 Ω. A resistance of 6 Ω is connected between *B* and *D*. A 10 V battery of internal resistance 2 Ω is connected between *A* and *C*. Calculate the branch current and current supplied by the battery by using Kirchhoff's laws. 10

13. *(a)* Find the current through 20 Ω resistance of the network shown in the figure by using super-position theorem. 5



(b) Explain the method of generation of three-phase e.m.f. with vector diagram. 5

14. An alternating voltage $V = 200 \sin 314t$ volts is applied to a device which offers an ohmic resistance of 20 Ω to the flow of current in one direction while entirely preventing the flow of current in the opposite direction. Calculation the RMS value, average value and form factor. 10

15. A 20 Ω resistor is connected in series with an inductive coil and capacitor of 0·2 H and 150 μF across 200 V variable frequency supply. Find *(a)* resonant frequency, *(b)* current drawn at resonant frequency, *(c)* voltage across inductance and *(d)* voltage across capacitance. 10

16. *(a)* Derive an expression for impedance of an AC circuit consisting of resistance and a pure capacitor in series. Also draw the vector diagram. 5

(b) A capacitor of 100 μF is connected in series with a resistor of 50 Ω. The combination is connected across a 230 V, 50 Hz AC supply. Calculate *(i)* Impedance, *(ii)* Current, *(iii)* Power factor, *(iv)* Active power and *(v)* Reactive power. 5

17. An *R-L* circuit takes a current of 3 A at a power factor of 0·6 lag when connected to a 115 V, 50 Hz supply, another *R-C* circuit takes a current of 5 A at a power factor of 0·8 lead when connected to the same supply. If the two circuits are connected in parallel across a 230 V. 50 Hz supply, calculate *(i)* resistance and inductance of *R-L* circuits, *(ii)* resistance and capacitance of RC circuit and *(iii)* the current drawn and p.f. of the combined circuit. 10

18. Derive the equation for power and power factor of a three-phase balanced load using two-wattmeter method. 10

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