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C09–EE–303

3241

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2014

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. Explain ideal voltage source and ideal current source.

2. Define polyphase circuit and phase angle difference in polyphase circuit.

3. Represent the following from polar to rectangle and rectangle to polar form :

(a) (3 *j*4)

(b) (150 60)

4. An alternating current of frequency 60 Hz has a maximum value of 120 A. Calculate the time taken to reach 100 A after passing through a positive maximum value and its value is decreasing thereafter.

5. Derive the RMS value of a full-wave rectified alternating quantity.

6. Define series resonance and write the expression for resonance frequency.

7. What are different methods by which a parallel AC circuit can be solved?

8. The voltage across a 0·1 F capacitor is given by V 150 sin 400 t. What is the sinusoidal expression for the current?

9. A 3- delta-connected AC motor when connected to a 50-Hz AC supply develops 25 kW at efficiency 90% and the power factor is 0·8. Calculate the line current and phase current.

10. Prove that the current flowing in a neutral wire of a balanced 3-star-connected load is zero.

PART—B 10×5=50

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

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

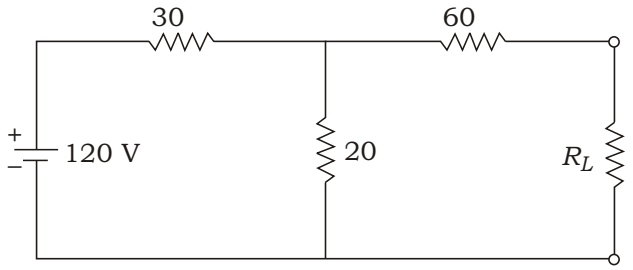
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. A Wheatstone bridge $ABCD$ is arranged as follows :

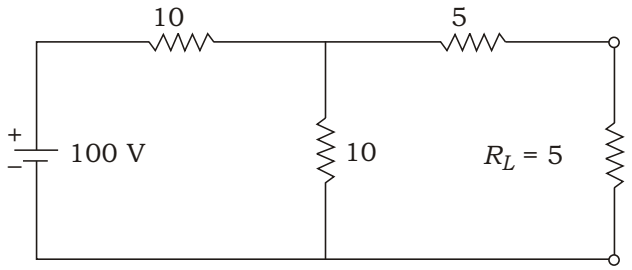
AB 2 ; BC 3 ; CD 4 ; DA 5

A resistance of 6 is connected between B and D. A 10 V battery of internal resistance 2 is connected between A and C. Calculate the branch currents and current supplied by the battery by using Kirchhoff's laws. 10

12. *(a)* Determine the value of R_L for maximum power in the resistance as shown in the figure below and also calculate the power delivered under these conditions : 5



(b) Using Norton's theorem, find the current in the load resistance R_L of the circuit shown below : 5



13. Four circuits *A*, *B*, *C* and *D* are connected in series across a 240-V, 50-Hz supply. The voltage across three of the circuits and their phase angles relative to the current through them are V_A = 80 V at 50° leading; V_B = 120 V at 65° leading and V_C = 135 V at 65° leading. If the supply voltage leads the current by 15°, find the value of V_D. Draw the vector diagram. 10

14. Two coils *P* and *Q* are connected in series across a 240-V, 50-Hz supply. The resistance of the coil *P* is 5 ohm and the inductance of the coil *Q* is 0·015 H. If the input from the supply is 3 kW and 2 kVAr, find the inductance of coil *P* and resistance of coil *Q*. Calculate also the voltage across each coil. 10

15. (a) Derive an expression for resonant frequency in an RLC parallel circuit. 5

(b) A coil of impedance 25 at 50 Hz has its pf 0·8. Determine the value of capacitor to be shunted with the coil to produce resonance at 100 Hz. 5

16. Two choke coils are connected in series, resistance and inductive reactance of coil *A* is 4 and 8 respectively, supply voltage is 200 V. Total power consumed in the circuit is 2·2 kW and reactive power consumed is 1·5 kVAr. Find the resistance and inductive reactance of coil *B*. 10

17. The load connected to a 3- supply comprises of 3 similar coils connected in star. The line current is 25 A and the kVA and kW outputs are 20 and 11 respectively. Find the line voltage, phase voltages, resistance and reactance of the coil. 10

18. Derive an equation for transformation of delta-connected resistance into star-connected resistances. 10

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