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C14–EE–303

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BOARD DIPLOMA EXAMINATION, (C–14)

MARCH/APRIL—2018

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 the limitations of Ohm's law. 3

2. Explain star and delta circuits. 3

3. Derive the relationship among poles, speed and frequency. 3

4. A sine wave has an RMS value of 50 V. Calculate the instantaneous value of voltages at *(a)* 30°, *(b)* 120° and *(c)* 360°. 1+1+1=3

5. Define *(a)* average value, *(b)* RMS value, *(c)* form factor of an alternating quantity. 3

6. Derive the relation between voltage and current in a pure-capacitive circuit. 3

7. Draw the impedance triangle of an *R-L-C* series circuit. 3

8. Compare series and parallel resonant circuits in any three aspects. 3

9. Define phase sequence of a polyphase system. Write the expressions for e.m.f.'s induced in three conductors of a 3-phase system. 3

10. Compare star and delta connections of a 3-phase system in any three aspects. 3

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)* Derive an equation for transformation of delta-connected resistance into star-connected resistance. 5

(b) Find the equivalent resistance between the terminals *A* and *B* of the network shown in Figure 1 : 5

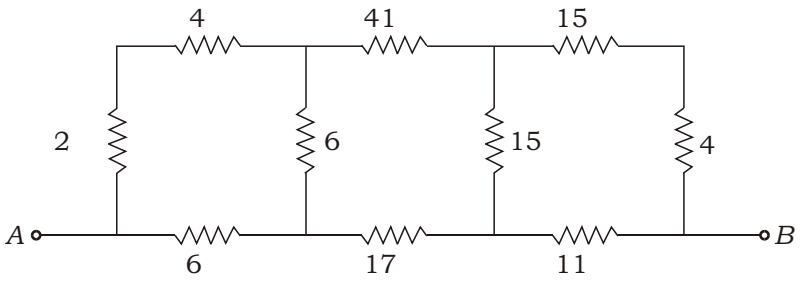

Fig. 1

12. Find the branch currents for the circuit shown in Figure 2 by using Kirchhoff's laws. 10

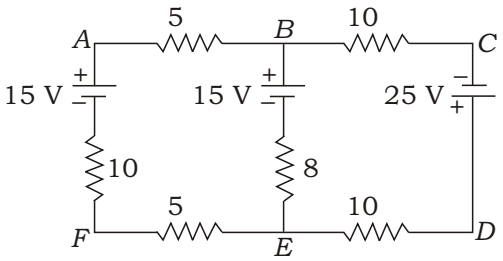

Fig. 2

13. Find the current through R_L 2 resistor for the circuit shown in Figure 3 by using Thevenin's theorem.: 10

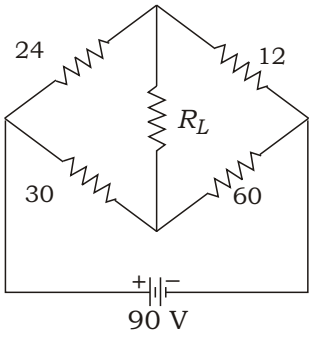

Fig. 3

14. *(a)* An alternating voltage varying sinusoidally with a frequency of 50 Hz has a maximum value of 28·28 V. Write the equation for its instantaneous value and find its value after *(i)* 0·0025 sec and *(ii)* 0·0125 sec. 5

(b) Perform : 5

$$\frac{(12 \quad j24) \quad 4 \quad 90}{(12 \quad j24) \quad 4 \quad 90}$$

15. *(a)* A series *R-L-C* circuit consists of a resistor of 100 , an inductor of 0·318 *H* and a capacitor of unknown value. This is energized by 230 0 , 50 Hz supply. The current is found to be 1 15 60 . Find the *(i)* value of capacitor, *(ii)* voltage across the inductor and *(iii)* total power consumed. 6

(b) Define series resonance and derive an expression for resonance frequency. 4

16. *(a)* It is desire to operate a 100 W, 120 V lamp at its current rating from a 240 V, 50 Hz supply by using a choke coil having resistance of 10 . Find *(i)* inductance of the coil, *(ii)* power factor and *(iii)* power consumed by the circuit. 6

(b) A series *R-L-C* circuit consists of *R* 1000 , *L* 100 mH and *C* 10 F. If the applied voltage across the circuit is 100 V, find *(i)* resonant frequency, *(ii)* current at resonance and *(iii)* *Q*-factor of the circuit. 4

17. *(a)* Define dynamic impedance and derive the formula for resonant frequency in *R-L-C* parallel circuit. 5

(b) Two impedances Z_1 (5 j10) and Z_2 (10 j15) are connected in parallel. If the total current supplied to the combination is 20 A, find *(i)* the voltage applied and *(ii)* power dissipated in each branch. 5

18. *(a)* Three similar coils are connected in star across a 3-phase, 400 V, 50 Hz system takes a current of 4 A at a lagging p.f. of 0·8 from the mains. Calculate *(i)* the resistance and inductance of each coil, *(ii)* the power drawn from the mains and *(iii)* the reduction in power drawn if one of the three coils becomes open circuited. 6

(b) A 3-phase induction motor working on 400 V takes a line current of 30 A at p.f. of 0·866 lag. Two wattmeters are connected to measure the input power to the motor. What will be the wattmeter readings? 4

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