



C14-EE-303

4245

**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

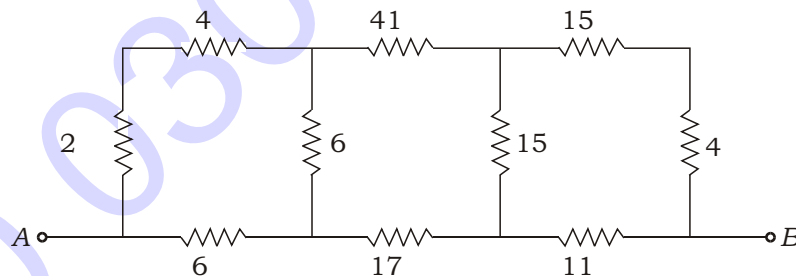


Fig. 1

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

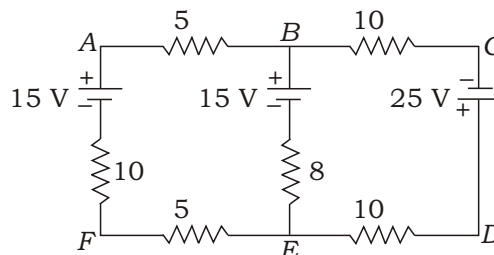


Fig. 2

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

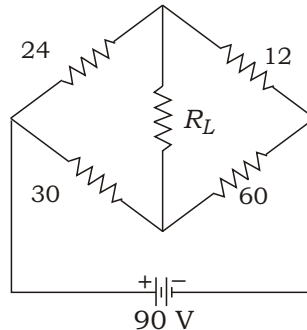


Fig. 3

- 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  $100 \Omega$ , an inductor of  $0.318 H$  and a capacitor of unknown value. This is energized by  $230 \angle 0^\circ$ , 50 Hz supply. The current is found to be  $1.15 \angle 60^\circ$ . 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 desired 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  $10 \Omega$ . 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  $R = 1000 \Omega$ ,  $L = 100 \text{ mH}$  and  $C = 10 \mu\text{F}$ . 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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