



C09-EE-303

3241

BOARD DIPLOMA EXAMINATION, (C-09)
MARCH/APRIL—2016
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 Kirchhoff's laws. 3
2. State Thevenin's theorem. 3
3. Derive the RMS value of a half-wave rectified alternating current. 3
4. Derive the relation between number of poles, speed and frequency. 3
5. In the equation, $V_m = V \frac{ZQ}{Z^2 + Q^2}$, $V = 100 \angle 0$ volts, $Z = 10 \angle 60$ and $Q = 8 \angle 30$ amp. Express V_m in polar. 3
6. Why is a parallel resonant circuit called as rejector circuit? 3
7. Why is $R-L-C$ series resonant circuit called as acceptor circuit? 3
8. Derive an expression for the impedance of an a.c. circuit, consisting of a resistance and capacitance in series with a neat vector diagram. 3

9. Give an expression for power in a 3-phase circuit in terms of phase and line values. 3
10. A 3-phase, 415-V, 50-Hz supply is given to a balanced delta connected load. The current in each branch circuit is 30 A and phase angle is 30° lag. Find (a) the line current and (b) the total power. 1+2=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) Explain superposition theorem. 4
- (b) Find the current in the 4 resistor of branch AB of the network shown in the figure 1 by using superposition theorem : 6

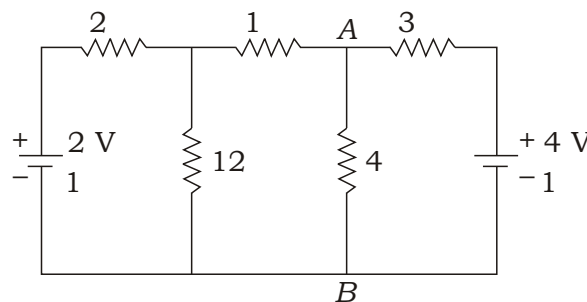


Fig. 1

12. (a) State the maximum power transfer theorem. 4
- (b) Find the current through 30 resistor of the network shown in the figure 2 by using Norton's theorem : 6

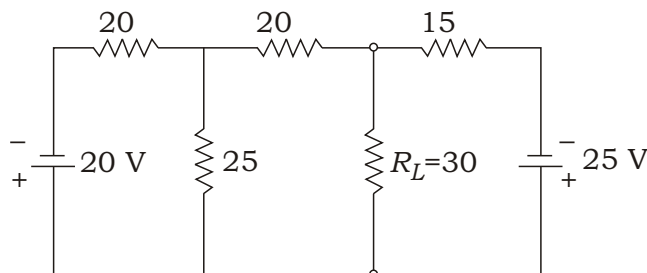


Fig. 2

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
 (a) V_A , 80 V at 50° leading; (b) V_B , 120 V at 65° leading and
 (c) 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 impedances are connected in parallel across 50 Hz single-phase supply as shown in figure 3. Calculate the current in each branch, total admittance and supply voltage, when the total current is 30 A. Also determine the p.f. of the circuit. Draw the vector diagram. 2+2+2+2+2=10

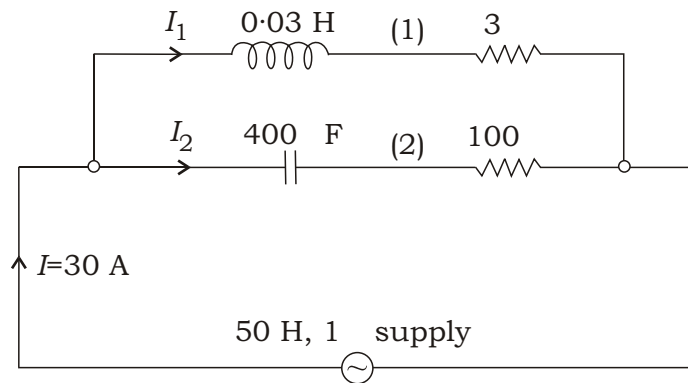


Fig. 3

15. Two choke coils are connected in series. Resistance and inductance of coil *A* are 4 Ω and 8 mH 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
16. (a) The current flowing through a pure inductor is 20 A. Find the inductance and power consumption, when the voltage applied across the inductor is $V = 200 \sin 314 t$. 5
- (b) Show that the power consumed by a pure inductor is zero when a.c. supply is applied to it. 5
17. (a) Derive the relation between line and phase voltages for a balanced star-connected system. 5
- (b) Three coils each of resistance of 10 Ω and inductance of 30 mH are connected in star across 400 V, 3 ϕ , 50 Hz a.c. supply. Calculate the current drawn in each line, power factor and the total power drawn. 5

18. (a) Derive an equation for transformation of star-connected resistance into delta-connected resistance. 5
- (b) The current in a circuit is given by $(4.5 - j12) A$ when the applied voltage is $(100 + j150)V$. Determine the (i) magnitude of impedance, (ii) phase angle, (iii) power factor and (iv) power consumed and reactive power using conjugate of current. 5
