* 4245 *

C14–EE–303

4245

BOARD DIPLOMA EXAMINATION, (C–14)

OCT/NOV—2015

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) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define active and passive circuits. 1½+1½=3

2. State Kirchhoff's laws. 1½+1½=3

3. Define the following terms : 1+1+1=3

(a) Cycle

(b) Time period

(c) Amplitude

4. Define phase and phase difference of an alternating quantity. 1½+1½=3

5. Convert the following rectangular to polar or polar to rectangular : 1½+1½=3

(a) $3 - j6$

(b) $100\angle 45°$

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

7. When a voltage of $(100+j60)$ V is applied to a circuit, a current of $(3+j6)$ A is flowing. Find the average power consumed in the circuit. 3

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

9. What are the basic features of a balanced 3ϕ system? 3

10. List out any three advantages of poly-phase system over single-phase system. 3

PART—B 20×2=40

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 star-connected resistances into delta-connected resistances. 5

(b) A network of resistors is shown in Fig. 1. Find the resistance between the terminals *A* and *B* by using star/delta transformation. 5

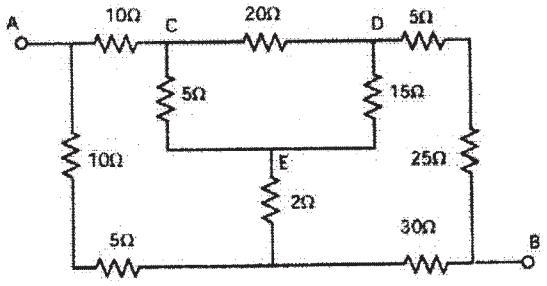

Fig. 1

12. Find the current through 4 Ω resistor of the circuit shown in Fig. 2 by using Kirchhoff's laws. Also find the total current supplied by the voltage source. 8+2

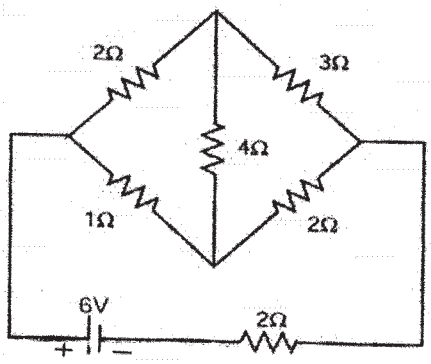

Fig. 2

13. *(a)* Convert the given current source (Fig. 3) into voltage source. 3

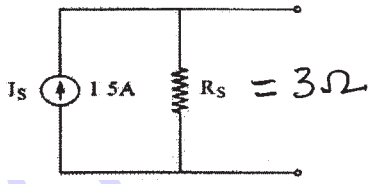

Fig. 3

(b) Find the current through 12 ohm resistor for the circuit shown in Fig. 4 by using superposition theorem. 8

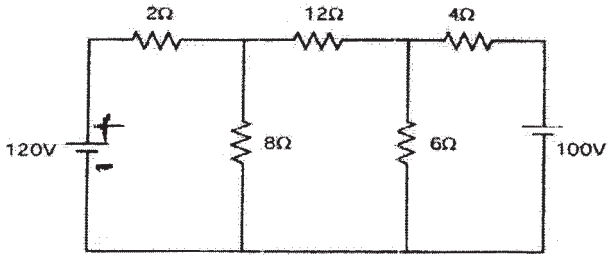

Fig. 4

14. *(a)* Derive the formula for average value of sinusoidal current wave by using analytical method. 4

(b) A sinusoidal current wave is given by $i = 100 \sin 100 \pi t$. Determine *(i)* the average value *(ii)* RMS value *(iii)* form factor *(iv)* peak factor. 2+2+1+1

15. *(a)* Derive the relation between voltage and current in a pure capacitive circuit. 4

(b) A coil takes a current of 5 A from a 20 V d.c. supply. When connected to a 200 V, 50 Hz a.c. supply, the current is 25 A. Calculate *(i)* resistance *(ii)* inductance *(iii)* impedance of the coil, and power factor of the circuit. Also draw the relevant phasor diagram. 4+2

16. *(a)* Define resonant frequency and derive the formula for resonant frequency of an RLC series. 4

(b) Find total impedance, line current, voltage across each and power factor for a series circuit, consisting of a coil of inductance 0·1 H, resistance 8 Ω and a capacitance of 120 μF connected to a 250 V, 50 Hz supply. 6

17. *(a)* An inductive coil of resistance 20 ohms and inductance 0·01 H is connected to a 200 V, 50 Hz supply. What capacitance placed in parallel will produce resonance? Also find the total current taken from the supply. 4

(b) A coil of resistance 50 Ω and inductance 318 mH is connected in parallel with a circuit consisting of a 75 Ω resistor in series with a 159 μF capacitor. The circuit is connected to a 230 V, 50 Hz supply. Determine the supply current and power factor of the circuit. 6

18. *(a)* Define polyphase circuit. Draw graphically 3-phase waveforms and write their e.m.f. equations induced in three phases. 5

(b) Three similar coils each having an impedance of $(8 + j6)$ ohm are connected in star to a 3-ph 400 V supply. Find the line current, power and power factor. If two wattmeters are used to measure power, calculate the reading of two wattmeters. 5

★ ★ ★