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C14–EE–303

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BOARD DIPLOMA EXAMINATION, (C–14)

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

1. Define the terms branch, loop and junction of an electrical network. 1+1+1

2. Define unilateral circuit and bilateral circuit with an example of each. 1½+1½

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

(a) Instantaneous value

(b) Form factor

(c) Peak factor of an alternating quantity

4. Derive average value of a half-wave rectified sine wave. 3

5. A sinusoidal voltage has a maximum value of 100 V with 50 Hz frequency. Find *(a)* instantaneous value after 0·002 sec and *(b)* the time taken to reach 45 V for the first time. 1½+1½

6. Draw the graphical representation of series resonance by showing *(a)* resonant frequency, *(b)* impedance and *(c)* current. 1+1+1

7. Derive an expression for the impedance of *R-L-C* series circuit. 3

8. Why is a parallel resonant circuit called as rejector circuit? 3

9. Compare between star and delta connection of 3-phase system. 3

10. Three similar coils connected in star take a total power of 1·5 kW at a power factor of 0·2 lag from a 3-ph 400 V, 50 Hz supply. Calculate the resistance and inductance of each coil. 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)* State Kirchhoff's laws. 3

(b) Find the current through 5 resistor for the network shown in Fig. 1 by using Kirchhoff's laws. 7

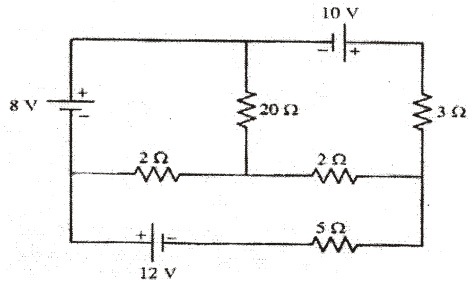

Fig. 1

12. *(a)* Find the equivalent resistance between *X* and *Y* for the circuit shown in Fig. 2. 5

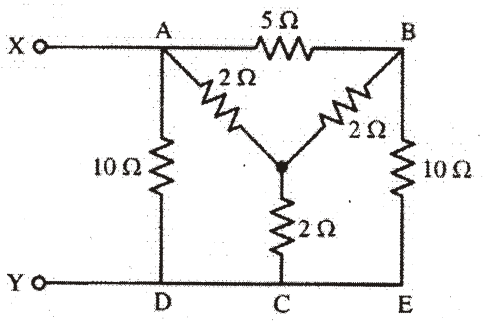

Fig. 2

(b) Find the current supplied by the battery using star/delta transformation for the circuit shown in Fig. 3. 5

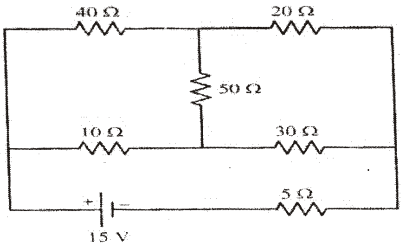

Fig. 3

13. (a) Determine the current through 10 ohm resistor of the network shown in Fig. 4 by using Norton's theorem. 6

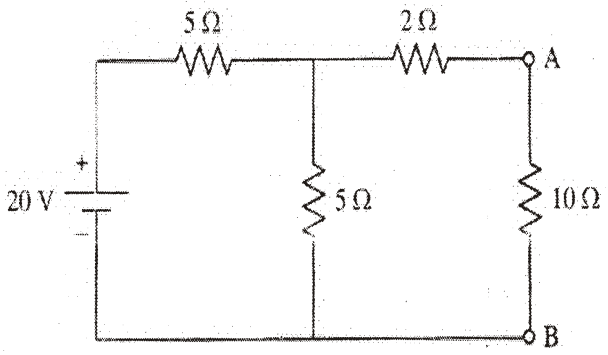

Fig. 4

(b) Find the value of R_1 of the network shown in Fig. 5 for which the power absorbed will be maximum. Also, find the value of maximum power. 4

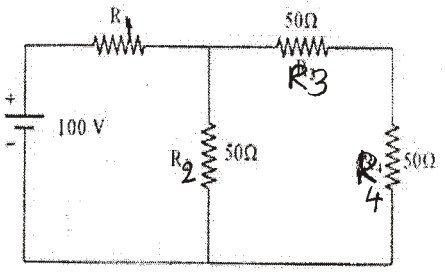

Fig. 5

14. (a) Derive the relationship between poles, speed and frequency. 5

(b) Define RMS value of an alternating current and derive its formula by using analytical method. 5

15. *(a)* Draw the impedance triangle of *R-L* and *R-C* series circuits. 2

(b) A coil *A* takes a current of 20 A at a power factor of 0·8 lag with an applied voltage of 100 V. Another coil *B* takes a current of 20 A at a power factor of 0·7 lag with an applied voltage of 50 V. What voltage will be required to produce a total current of 20 A with the two coils *A* and *B* in series. 8

16. A series *R-L-C* circuit with a resistance of 50 ohms, a capacitance of 25 F and an inductance of 0·15 H is connected across a 230 V, 50 Hz supply. Determine the impedance, current, power factor and power consumption of the circuit. Also draw the relevant phasor diagram. 10

17. Three impedances Z_1 (19 23 j12 82) , Z_2 (0 j62 5) and Z_3 (12 j15) are connected in parallel across a 100 V, 50 Hz a.c. supply. Find the current in each branch and total current. 10

18. *(a)* What are the effects of load power factor on wattmeter readings of a 3-ph a.c. circuit? 4

(b) Three identical coils connected in delta to a 415 V, 50 Hz, 3-ph a.c. supply takes a line current of 5A at a power factor of 0·8 lag. If these coils are connected in star to the same supply calculate the line current and total power. 6

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