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C09–EE–303

3241

BOARD DIPLOMA EXAMINATION, (C–09)

APRIL/MAY—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) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. How do you convert the given ideal current source into ideal voltage source?

2. State maximum power transfer theorem.

3. Two currents are given by the expressions i_1 10 sin (314t 45) amp, i_2 8 sin (314t 60) amp. Find i_1 i_2 and represent them in the similar form.

4. Define the following terms :

(a) RMS value

(b) Average value of an alternating quantity and their values for a sinusoidal

5. Perform the following operations :

(a) A B

(b) A/B if A 3 $j4$, B 10 60

6. Define Q-factor for a parallel resonant circuit.

7. A choke coil takes a current of 2·5 A when connected across 250 V, 50 Hz mains and consumes 400 watts. Find *(a)* resistance of the coil, *(b)* inductance of the coil and *(c)* PF.

8. Two circuits having impedances of Z_1 (6 $j8$) and Z_2 (10 $j8$) are connected in parallel across an a.c. supply. Calculate the admittance of the combination.

9. The phase voltage of a 3-phase, 5 MVA star-connected alternator is 6500 volts. Calculate *(a)* the line voltage and *(b)* full-load line current of the alternator.

10. Derive an expression for power in a 3-phase circuit.

PART—B

10×5=50

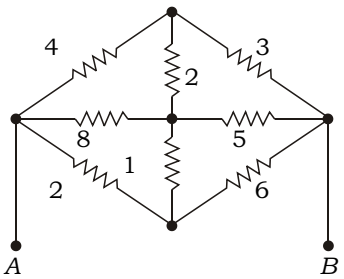
Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

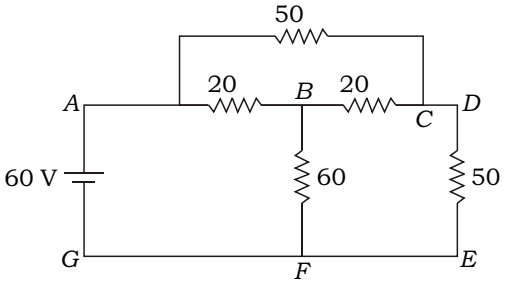
(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. *(a)* Derive an equation for transformation of delta-connected resistances into star-connected resistances. 5

(b) Find the resistance between the terminals A and B as shown in the figure below : 5



12. Determine the load current through the branch *DE* in the circuit shown in the figure below by using Thevenin's theorem :



13. An alternating current of frequency 60 Hz has a maximum value of 120 A.

(a) Write the equation for instantaneous value.

(b) Reckoning time from the instant, the current is zero and becoming positive. Find the instantaneous value after 1/360 sec.

(c) Calculate the time taken to reach 96 A for the first time.

14. *(a)* Derive an expression for impedance of an AC circuit consisting of resistance and a pure capacitor in series. Draw also the vector diagram. 5

(b) A capacitor is 50 F is connected in series with a resistor of 100 . The combination is connected across a 230 V, 50 Hz AC supply. Calculate *(i)* impedance, *(ii)* current, *(iii)* power factor, *(iv)* active power and *(v)* reactive power. 5

15. A lamp of rating 100 W, 125 V is connected in series with an element and the system is connected across a supply of 230 V, 50 Hz. Find the value of the series-connected element, if it is *(a)* resistor, *(b)* inductor and *(c)* capacitor.

16. A resistor, choke coil and a capacitor of 25 2 F are connected in series. The circuit draws a current of 0·4 A when it is connected to an AC supply. If the voltage across resistor is 20 V, voltage across choke coil is 35 V, voltage across resistor and choke coil is 45 V, and voltage across capacitor is 50 V, calculate—

(a) the parameters of choke coil;

(b) applied voltage and its frequency;

(c) p.f. of the total circuit and active power consumed. Draw the vector diagram.

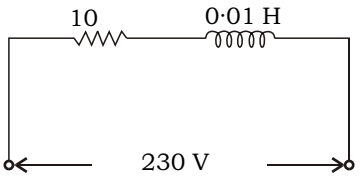
17. Derive the relation between line and phase voltages for a balanced star-connected system.

18. *(a)* Two batteries *A* and *B* having e.m.f. of 20 V and 24 V respectively and internal resistances of 0 8 and 0 2 respectively are connected in parallel across 60 resistor. Calculate—

(i) the current through each battery;

(ii) the terminal voltage.

(b) Calculate the impedance at each of the following frequencies and also determine the current at each frequency in the given circuit :



(i) 80 Hz

(ii) 1·5 kHz

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