C20-EE–305

7249

BOARD DIPLOMA EXAMINATION, (C-20)

NOVEMBER/DECEMBER—2022

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. Define branch, junction and loop in an electric circuit.

2. When three resistances of 4 Ω, 6 Ω, and 10 Ω are connected in star, find the equivalent delta connected resistances.

3. State maximum power transfer theorem.

4. Define *(i)* Average value and *(ii)* RMS value of an alternating quantity.

5. Derive an expression for average value of full wave rectified sine wave.

6. Convert the following quantities from polar to rectangular or vice-versa :

(i) $100\angle 30$

(ii) $8 + j6$

(iii) $5 - j4$

7. Prove that the average power consumed in a pure capacitor is zero.

8. A pure inductive coil takes a current of 40 A from, 250 V, 50 Hz supply. Find the inductance of the coil.

9. Define the term poly-phase.

10. Show that the line voltage in 3-phase star connected system is equal to $\sqrt{3}$ times the phase voltage.

PART—B

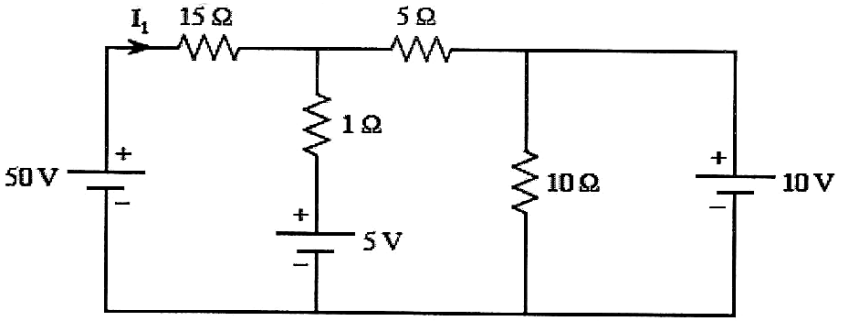
8×5=40

Instructions : (1) Answer **all** questions.

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

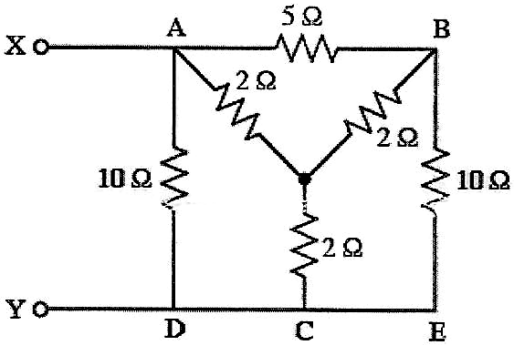
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* Find the current through 15 Ω resistor in the circuit shown in the figure by applying Kirchhoff's Laws.

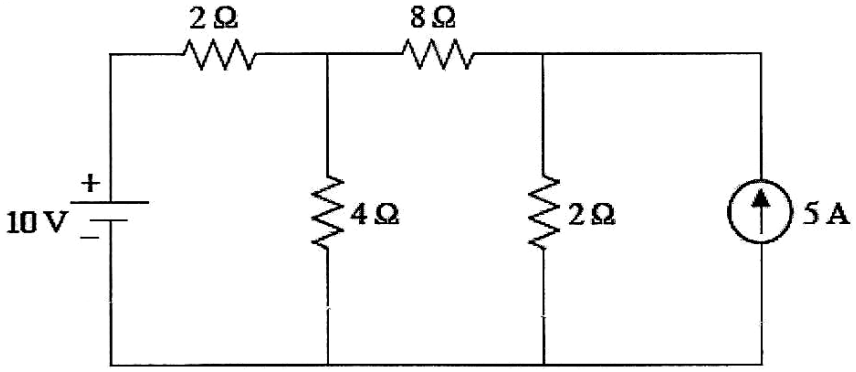


(OR)

(b) Find the equivalent resistance between X and Y in the resistive network shown in the figure by using Star-Delta transformation.

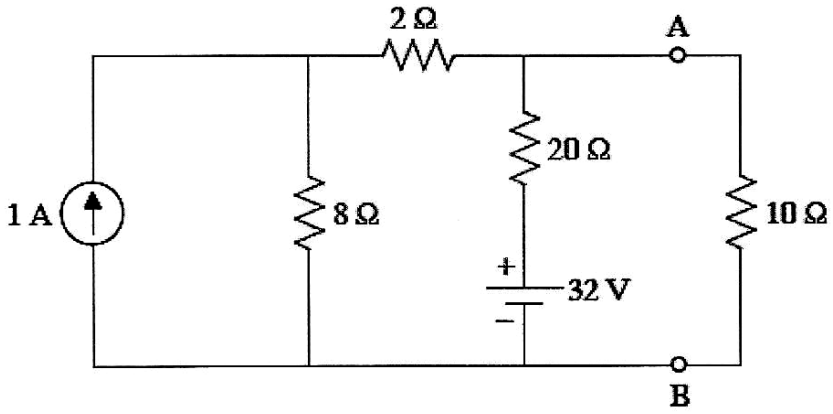


12. *(a)* Find the voltage across 4 Ω resistor in the circuit shown in the figure by using superposition theorem.



(OR)

(b) Find the current through 10 Ω resistor of the circuit shown in the figure by using Norton's theorem.



13. *(a)* A pure resistor is connected in series with a capacitor across a 250 V, 50 Hz supply. If the power absorbed by the resistor is 400 W at 160 V, find the resistance and capacitance.

(OR)

(b) A coil having a resistance of 20 Ω and an inductance of 0·07 H is connected in parallel with a capacitor of 60 μF, which is in series with a resistor of 50 Ω. Calculate the total current and phase angle when this combination is connected across 200 V, 50 Hz supply.

14. *(a)* A resistance of 12 Ω, an inductance of 0·15 H and a capacitance of 100 μF are connected in series across a 200 V, 50 Hz supply. Calculate *(i)* Impedance, *(ii)* Current, *(iii)* Power factor and *(iv)* Power consumed.

(OR)

(b) A coil of resistance 2 Ω and inductance of 0·01 H is connected in series with a capacitor across 200 V supply. Find the value of capacitance in order that maximum current flow occurs at a frequency of 50 Hz. Also find *(i)* voltage across the coil and *(ii)* voltage across capacitor.

15. *(a)* A balanced 3-phase delta connected load of 11 kW takes a lagging current of 15 A with a line voltage of 500 V. Find the circuit constants of the load per phase.

(OR)

(b) Explain the effect of load power factor on wattmeter readings in two-wattmeter method.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

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

16. Suggest the suitable alternator to give a terminal voltage of 230 V, if the voltage across each phase is 132·8 V. Justify, if this alternator is supplied to a delta connected load of (10 + *j*8) Ω. Find *(a)* current in each phase of the load, *(b)* current in each phase of the alternator, *(c)* power factor of the load and *(d)* power drawn by the load.

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