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C20-EE–305

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BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2024

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 Junction, Branch and Loop in electrical circuits.

2. Three resistances 30 Ω, 40 Ω and 60 Ω are connected in Star. Find the equivalent Delta connected resistances.

3. Define ideal voltage source and ideal current source.

4. Define *(a)* RMS value and *(b)* Average value of an AC quantity.

5. Define the terms phase and phase difference of an AC quantity.

6. Perform the following operations *(i)* $A \times B$ *(ii)* $A \div B$ where $A = 6 + J8$, $B = 3 - J4$.

7. A pure resistance of 50 ohms is in series with a pure capacitance of 100 microfarads across 100 V, 50 Hz supply. Find current in the circuit.

8. Define resonance and give the formula for resonant frequency of series *R-L-C* circuit.

9. Define Q-factor for the series resonant circuit.

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

PART—B

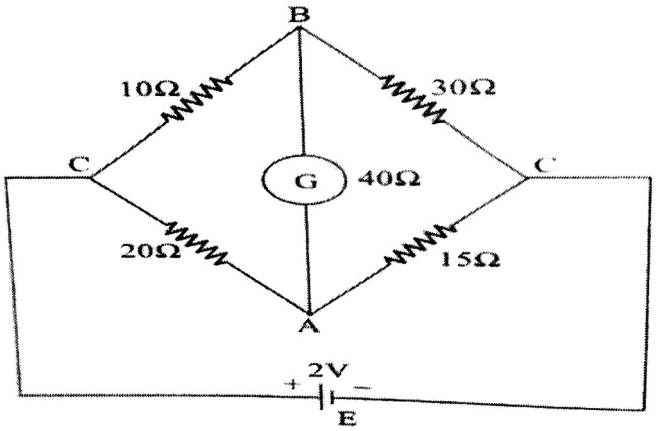
8×5=40

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

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

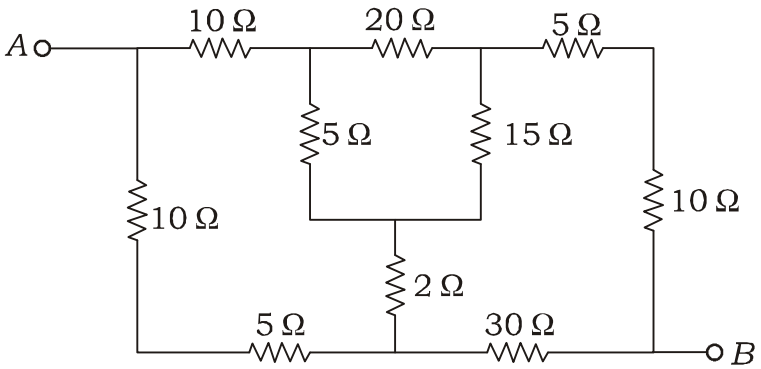
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* Find the current passing through each resistor in the circuit shown in figure by using Kirchhoff's laws.

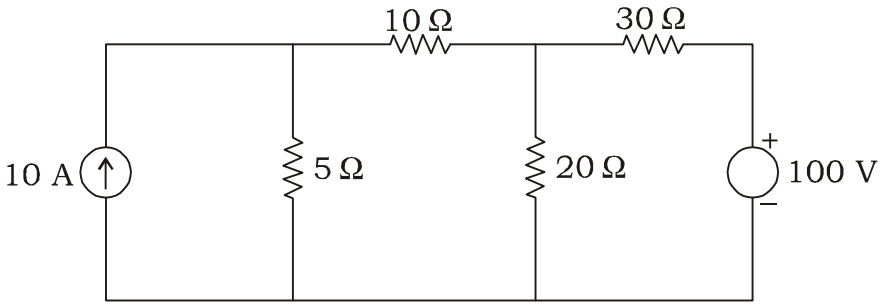


(OR)

(b) A network of resistances is shown in figure. Find the equivalent resistance between terminals *A* and *B* using Star-Delta transformation.

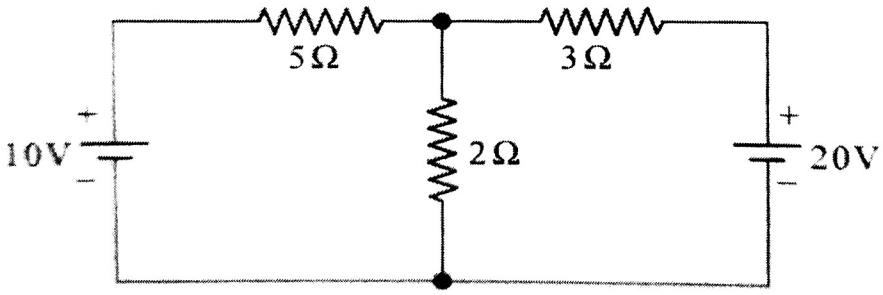


12. *(a)* Find the current passing through 20 Ω resistance in the circuit shown below by using superposition theorem.



(OR)

(b) Determine the power absorbed by 2 Ω resistor in the circuit shown below by using Thevenin's theorem.



13. *(a)* A coil of resistance 10 Ω and inductance 0·1 H is connected in series with a 150 μF capacitor across 200 V, 50 Hz supply. Calculate *(i)* the inductive reactance, *(ii)* the capacitive reactance, *(iii)* the impedance, *(iv)* the current, *(v)* the power factor and *(vi)* the voltage across the coil and capacitor respectively.

(OR)

(b) A series R-L circuit takes a current of 3A at a power factor of 0·6 lag when connected to 115 V, 50 Hz supply. Another series *R-C* circuit takes a current of 5 A at a power factor of 0·707 lead when connected to the same supply. If the two circuits are connected in series across a 230 V, 50 Hz supply. Calculate *(i)* the current, *(ii)* the power consumed and *(iii)* the power factor.

14. *(a)* Explain the method of solving two branch parallel AC circuit by using admittance method.

(OR)

(b) A coil of resistance 5 Ω and inductance 0·02 H is connected in parallel with another coil of resistance 1 Ω and 0·08 H. The circuit is connected to 100 V, 50 Hz supply. Find *(i)* the supply current and *(ii)* power factor of the circuit by using vector method.

15. *(a)* Three coils, each having a resistance of 20 Ω and an inductive reactance of 15 Ω are connected in Star to 440 V, 3-phase, 50 Hz supply. Calculate *(i)* the line current, *(ii)* power factor and *(iii)* power supplied.

(OR)

(b) The power input to a 440 V, 50 Hz 3-phase delta connected motor is measured by using two wattmeters. The readings of the wattmeters are found to be 20 kW and –10 kW respectively. Calculate *(i)* the input power, *(ii)* the power factor, *(iii)* the line current and *(iv)* the HP output.

PART—C

10×1=10

Instructions : (1) Answer the following question.

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

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

16. A series circuit contains a resistance of 4 Ω, an inductance of 0·5 H and a variable capacitor across a 100 V, 50 Hz supply. Find *(i)* the capacitance for getting resonance and *(ii)* potential difference across inductance and capacitance.

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