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C20-EE–305

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BOARD DIPLOMA EXAMINATION, (C-20)

OCTOBER/NOVEMBER—2023

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.

2. Differentiate between active and passive circuits in any three aspects.

3. State Thevenin's theorem.

4. Define form factor and peak factor.

5. Derive the relation between poles, speed and frequency of an AC quantity.

6. The equation of an alternating quantity is $i = 100 \sin (314t)$. Determine *(a)* RMS value and *(b)* average value.

7. Define resonance frequency and give the formula for resonance frequency in RLC series circuit.

8. Write the instantaneous voltage and current equations in a pure capacitive circuit.

9. A series resonant RLC circuit has a $R = 20\ \Omega$, $L = 20\ \mu H$, $C = 100\ \mu F$. Find the resonant frequency.

10. Define polyphase and list any three advantages of polyphase over single phase.

PART—B

8×5=40

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

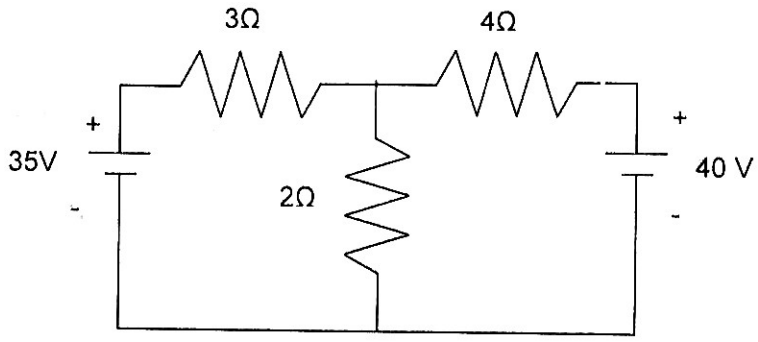
(2) Each question carries **eight** marks.

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

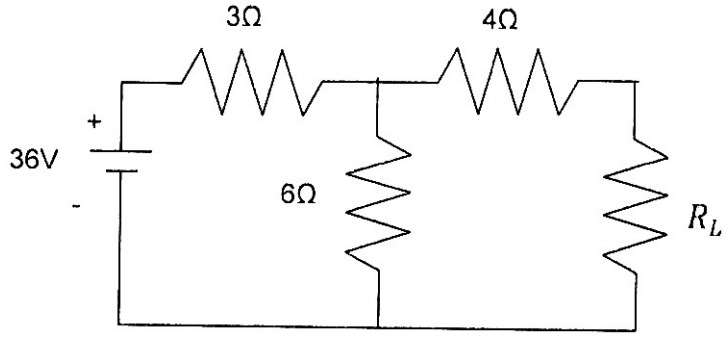
11. *(a)* Develop transformation formulae for delta to star transformation.

(OR)

(b) Find the current in 2 Ω resistor in the circuit shown in figure by using Kirchhoff's laws.

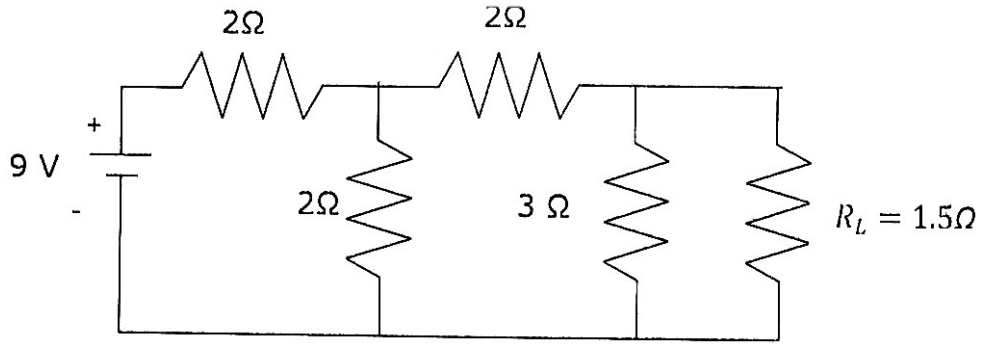


12. *(a)* Determine the maximum power to be transferred to R_L of the network shown in figure.



(OR)

(b) Using Norton's theorem, find the current in the load resistor R_L in the network shown in figure.



13. *(a)* A coil has a resistance of 25 Ω and an inductance of 0·1 H connected across 200 volts, 50 Hz. Find the following :

(i) Impedance

(ii) Current

(iii) Power factor

(iv) Power

(OR)

(b) Derive relationship between voltage and current in a pure inductive circuit with wave forms.

14. *(a)* A coil of resistance 10 Ω and an inductance of 1 H is connected in series with a capacitor of 20 μF across 100 V, 50 Hz supply. Calculate the following :

(i) Impedance

(ii) Current

(iii) Power factor

(iv) Power

(OR)

(b) A series RL circuit has R = 25 Ω and X_L = 32 Ω. It is connected in parallel to a capacitor of 100 μF and the combination is connected across a 200 V, 50 Hz supply. Find the current in each branch and total current.

15. *(a)* Derive the relation between phase and line voltages, phase and line currents for balanced 3-phase star connected system.

(OR)

(b) The phase impedance of a delta connected load is $(15 + j20)\ \Omega$. If the applied line voltage is 220 volts. Find the following :

(i) Phase current

(ii) Line current

(iii) Power

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 coil of resistance 40 Ω and inductance of 0·7 H form part of RLC series circuit for which the resonance frequency is 60 Hz. Find the capacitance and also find *(a)* line current, *(b)* power factor and *(c)* voltage across the coil, if the supply voltage is 250 volts, 50 Hz.

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