



7243

BOARD DIPLOMA EXAMINATION, (C-20)
OCTOBER/NOVEMBER—2023
DECE – THIRD SEMESTER EXAMINATION

NETWORK ANALYSIS

Time : 3 Hours]

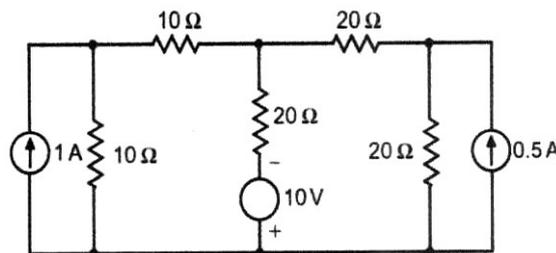
[Total Marks : 80

PART—A

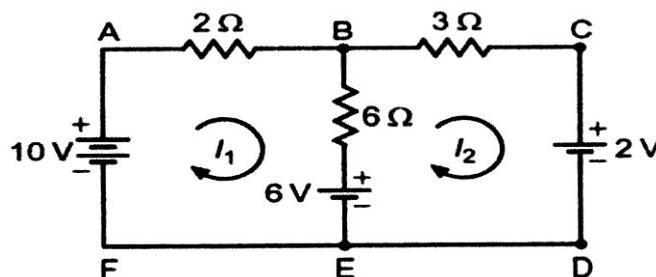
3×10=30

- 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 the terms branch, mesh and loop in circuits.
2. Determine the number of node voltage equations required to solve the given network below.



3. Write the mesh current equations for the given circuit below and arrange them in matrix form.



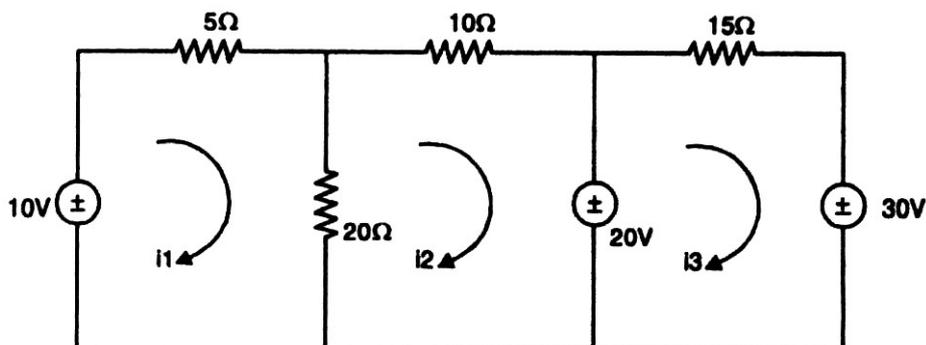
4. State the importance of Reciprocity theorem.
5. Explain the effect of resistance of bandwidth in series RLC circuit.
6. Compare any three parameters for series and parallel resonance.
7. Write the Laplace transform of the following functions :
 - (a) Sine function
 - (b) Cosine function
 - (c) Unit step function
8. Define the time constant of RL circuit.
9. State the change of scale property of Laplace transform.
10. List the disadvantages of constant K filters.

PART—B

8×5=40

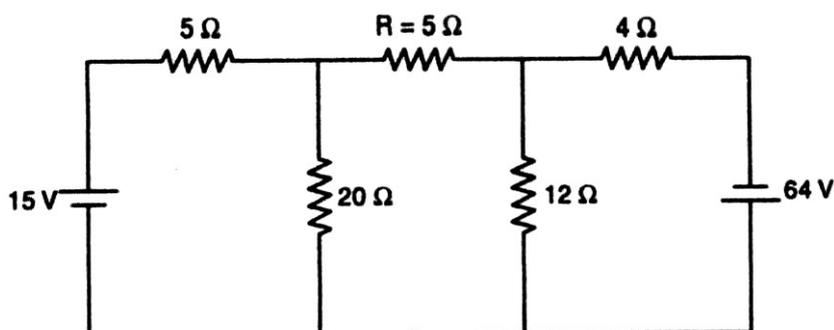
- Instructions :**
- (1) Answer **all** questions.
 - (2) Each question carries **eight** marks.
 - (3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. (a) Solve for mesh currents using Cramer's rule for the given network below.

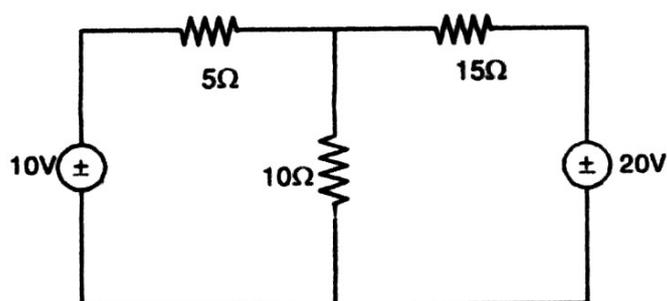


(OR)

- (b) Find the current through $5\ \Omega$ resistor in the circuit shown below using node voltage analysis. Use Cramer's rule to solve nodal voltage equations.



12. (a) Find the current through $10\ \Omega$ resistor using Super position theorem.



(OR)

- (b) Explain Star and Delta configurations of resistances.

13. (a) A coil of $5\ \Omega$ resistance and $15\ \text{mH}$ inductance is connected in parallel with a capacitor of $16\ \mu\text{F}$. Calculate the frequency at which resonance occurs. Under this condition, find the value of dynamic impedance. Also find the total current at resonance when connected to a $200\ \text{V}$ supply and the current in each branch.

(OR)

- (b) A series RLC circuit with $R = 10\ \Omega$, $L = 1\ \text{mH}$ and $C = 1000\ \text{pF}$ capacitor is connected across a sinusoidal source of $20\ \text{V}$ with variable frequency. Calculate the following :
- (i) The resonant frequency
 - (ii) Q-factor of the circuit at resonance frequency
 - (iii) Lower cutoff frequency
 - (iv) Upper cutoff frequency

14. (a) Explain the DC response of RL circuit.

(OR)

(b) Using the Laplace transform, find the initial and final values of the following function :

$$f(t) = 4e^{-2t} + 2e^{-3t}$$

15. (a) Explain π type attenuators with circuit diagram.

(OR)

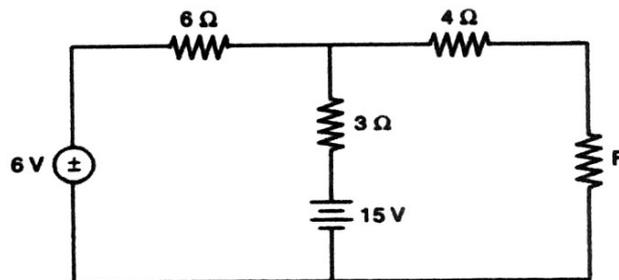
(b) Design a low pass T-type filter having a cut-off frequency of 2 kHz to operate with a terminated load resistance of 500 Ω .

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. Analyze the circuit to determine the maximum power delivered to load resistance (R). What will happen, if the resistor 6 Ω is replaced by an inductor?



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