C20-EC–305

# 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

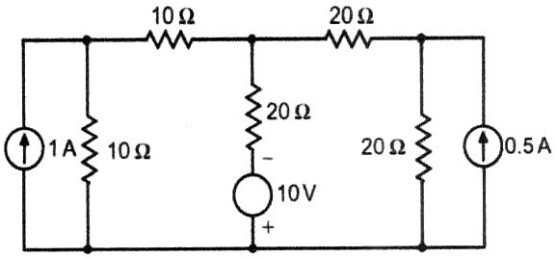
**Instructions :** (1) Answer **all** questions.

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

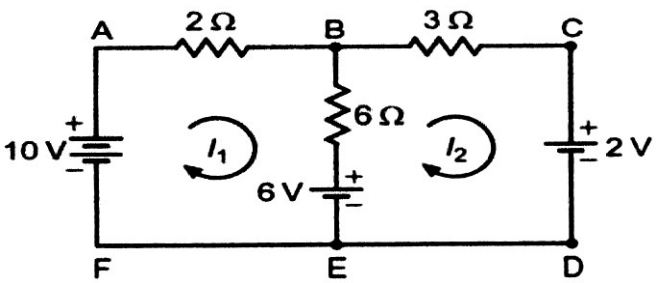
(3) Answers should be brief and straight to the point and shall not exceed five simple sentences.

**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

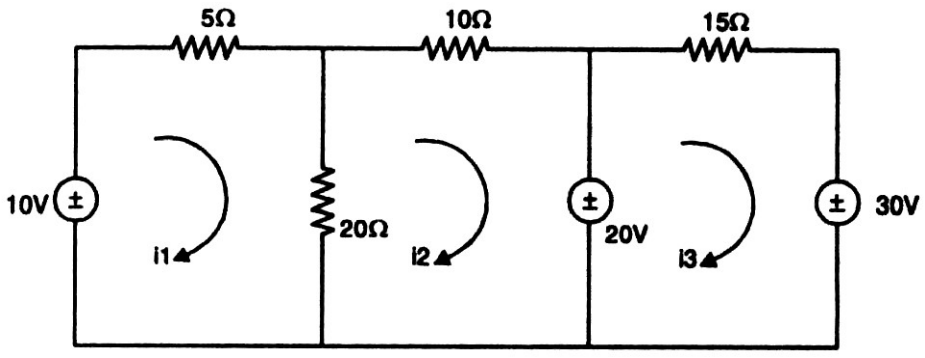
8×5=40

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

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

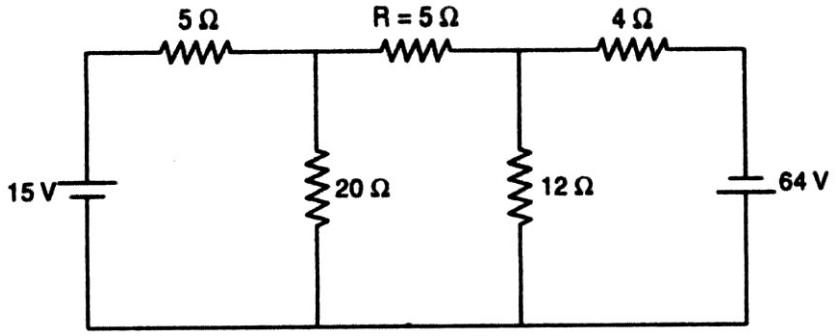
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

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

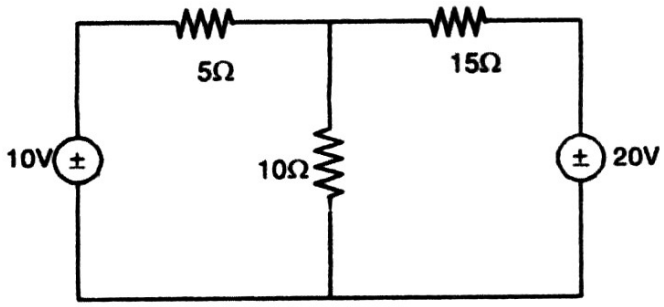


**(OR)**

*(b)* Find the current through 5 Ω 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 Ω resistor using Super position theorem.




**(OR)**

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

**13.** *(a)* A coil of 5 Ω resistance and 15 mH inductance is connected in parallel with a capacitor of 16 oμF. 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 V supply and the current in each branch.

**(OR)**

*(b)* A series RLC circuit with R = 10 Ω, L = 1 mH and C = 1000 pF capacitor is connected across a sinusoidal source of 20 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

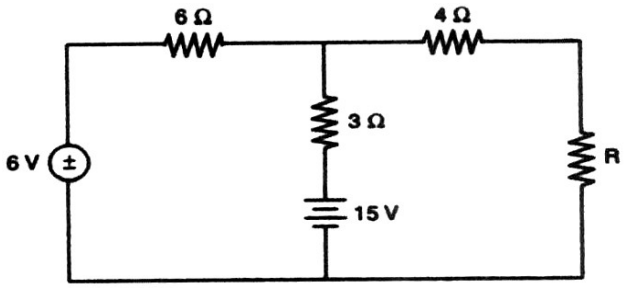
10×1=10

**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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