7243

BOARD DIPLOMA EXAMINATION, (C-20)

MAY—2023

DECE - THIRD SEMESTER EXAMINATION

NETWORK ANALYSIS

Time : 3 Hours] [*Total Marks* : 80

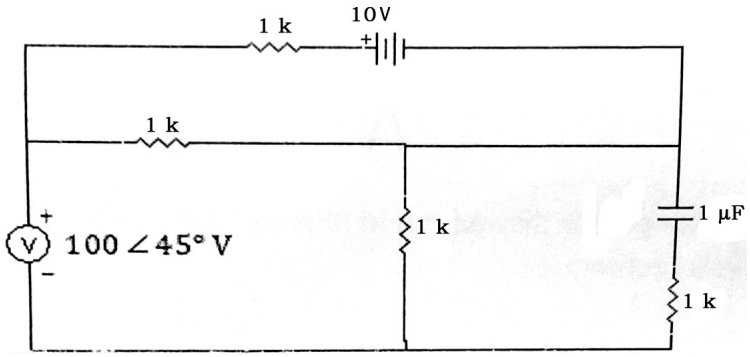
PART—A 3×10=30

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

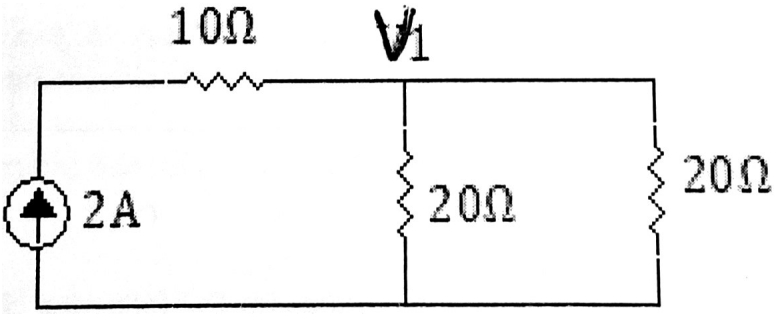
(2) Each question carries **three** marks.

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

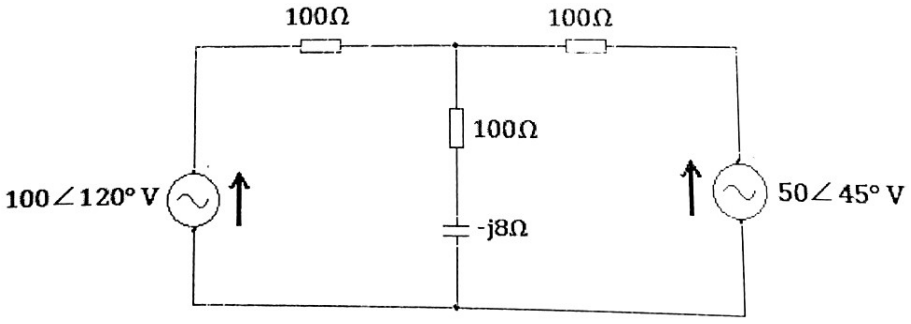
1. Determine the number of mesh equations required to analyse the following circuit :



2. Find the VI in the following circuit using node voltage analysis technique :



3. Write down the mesh current equations for the following network :



4. State superposition theorem.

5. State the conditions for resonance in a parallel *RLC* resonant circuit.

6. Define the terms bandwidth and selectivity.

7. Define time constant τ of RC series circuit.

8. Find the Laplace transform of unit step function.

9. State the frequency shifting property of Laplace transform.

10. Give the mathematical expressions for characteristic impedances of symmetrical T and π networks.

PART—B

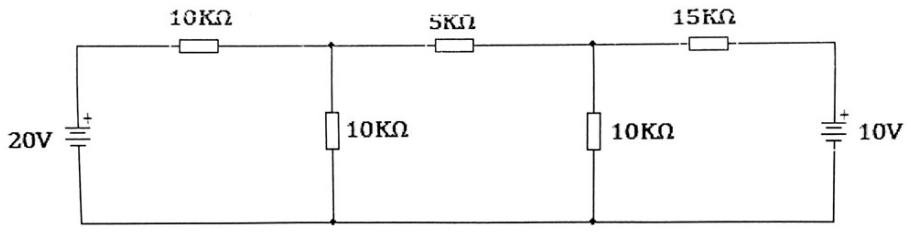
8×5=40

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

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

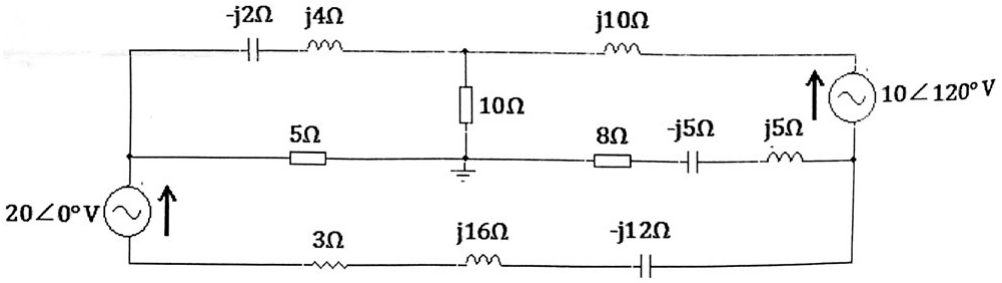
(3) Answers should be comprehensive and criterion for valuation is the content but not the length of the answer.

11. *(a)* Determine the power dissipation in 5 KΩ resistor of the following circuit using mesh current analysis technique :



(OR)

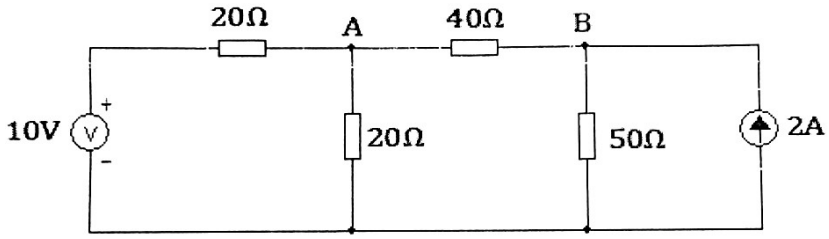
(b) Write down the node voltage equations for the following circuit and arrange them in matrix form :



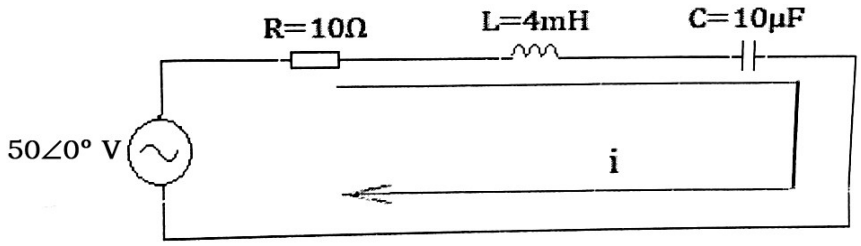
12. *(a)* State and prove maximum power transfer theorem for DC and AC circuits.

(OR)

(b) Find the voltage V_{AB} in the circuit shown in the figure using superposition theorem.



13. *(a)* Determine *(i)* resonant frequency, *(ii)* current **i** at resonant frequency, *(iii)* bandwidth and *(iv)* selectivity of the series resonant circuit shown in the figure :



(OR)

(b) Derive the expressions for resonant frequency and impedance at resonant frequency of practical parallel resonant circuit.

14. *(a)* Explain the DC transient analysis of *RLC* series circuit in under-damped case.

(OR)

(b) Transfer function of a system is given by

$$F(s) = \frac{(s+12)}{s(s+2)(s+3)(s+1)}$$

Find the time domain response $f(t)$, i.e. Inverse Laplace Transform of $F(s)$.

15. *(a)* Draw the circuit of T-section constant-K Lowpass filter and derive its design equations.

(OR)

(b) Design a π-section attenuator having 40 dB attenuation and characteristic impedance of 200 Ω.

PART—C

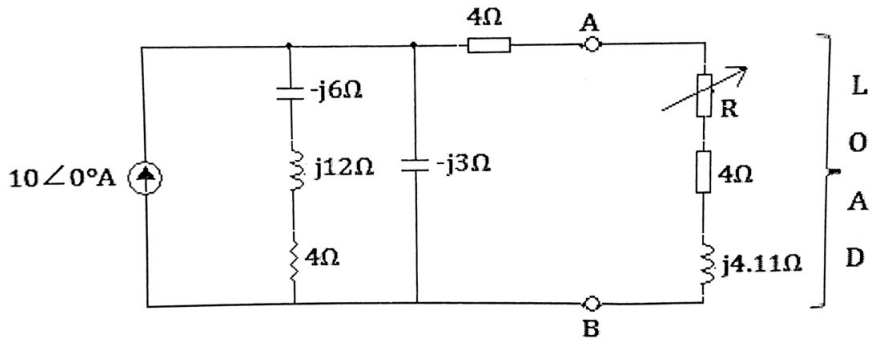
10×1=10

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. Find the Thevenin's equivalent of the following circuit at terminals A, B. Find the value of R at which maximum power transfers to the load :



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