



C09-EC-306

3238

BOARD DIPLOMA EXAMINATION, (C-09)

MARCH/APRIL—2018

DECE—THIRD SEMESTER EXAMINATION

CIRCUIT THEORY

Time : 3 hours ]

[ Total Marks : 80

PART—A

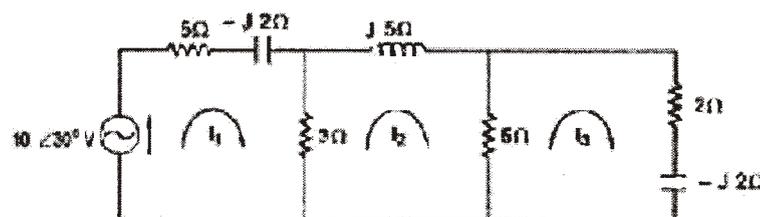
3×10=30

**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. A sinusoidal voltage of 5 kHz frequency is applied across a 10 mH inductor. Determine the inductive reactance.
2. Write the expression for the resonant frequency of  $L$  and  $C$  parallel circuits.
3. State the difference between active and passive circuit elements.
4. Write the mesh current equations in the network shown below :



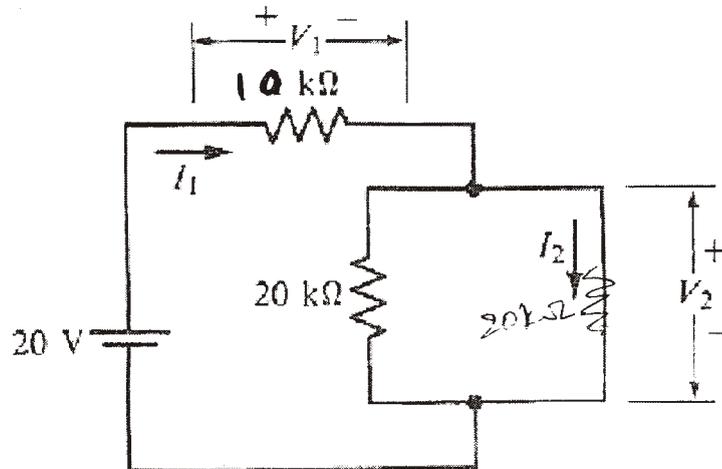
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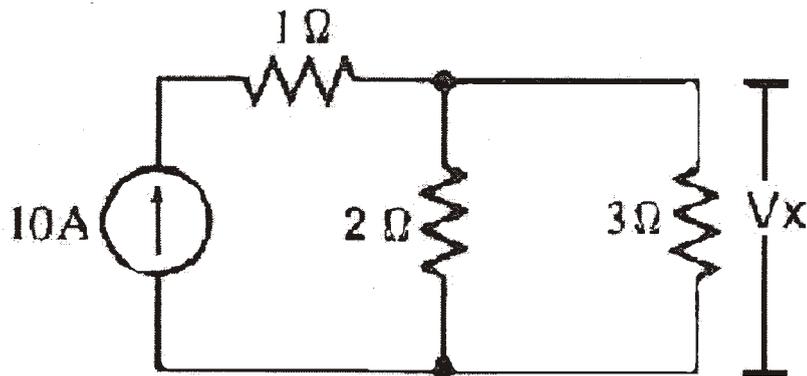
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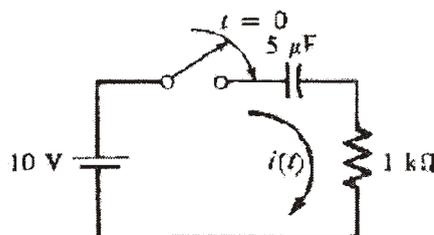
5. Find the current  $I_1$  in the figure shown below :



6. Draw the reciprocity theorem equivalent circuit shown in the figure below :



7. What is the equivalent current source for a voltage source of 12 V in series with 6 resistance?
8. When are double humps formed in the frequency response of a double-tuned circuit?
9. For the circuit shown in figure, write the mathematical expression for the charging current  $i(t)$  after the switch is closed :



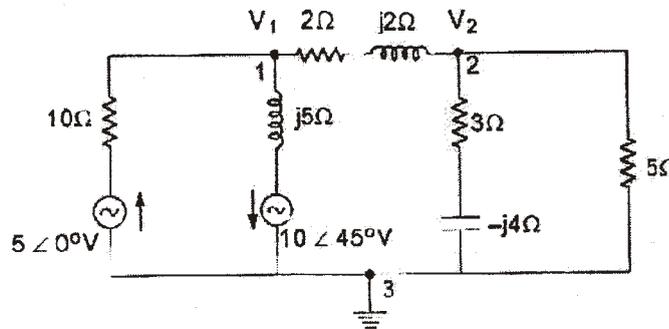
10. Write the expression for upper 3 dB frequency of low-pass R-C circuit.

**PART—B**

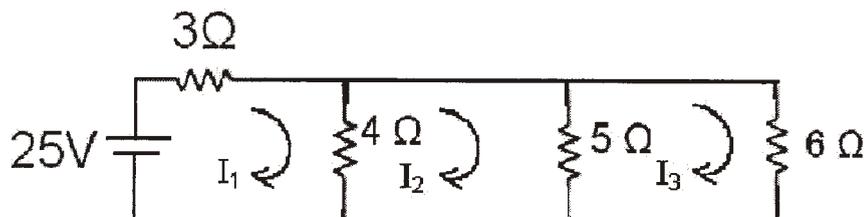
10×5=50

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

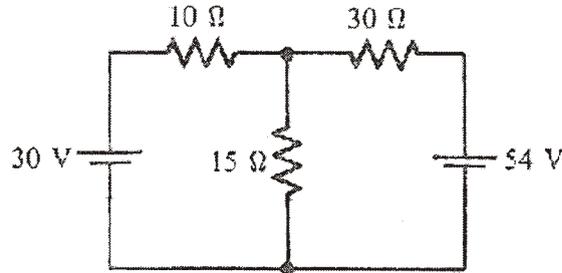
- 11.** (a) Distinguish between series and parallel resonances.  
 (b) Explain the effect of resistance on bandwidth of a series resonant circuit.
- 12.** (a) A sinusoidal voltage  $v(t) = 100 \sin 100t$  is applied across a pure capacitor of 10 F. Determine (i) current  $i(t)$  and (ii) instantaneous power  $p(t)$ .  
 (b) The a.c. voltage across a 10 F capacitor is  $v(t) = 50 \sin 500t$ . Determine (i) the capacitive reactance and (ii) the peak value of the current through the capacitor.
- 13.** Write the node voltage equations for the network shown below and express them in matrix form :



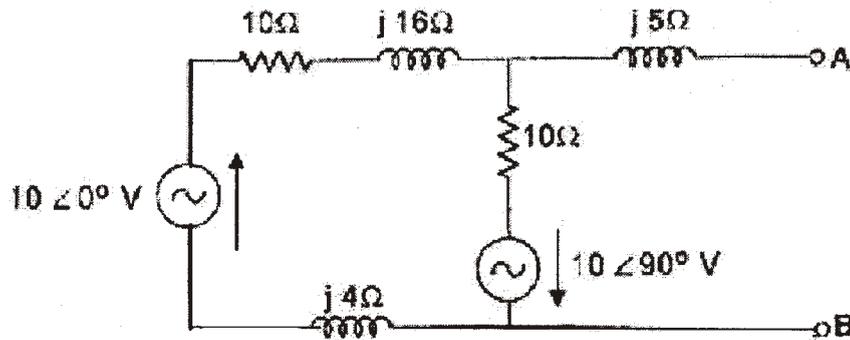
- 14.** Compute the mesh currents in the network shown below using driving-point impedance and transfer impedance :



15. Using the superposition theorem, find the current flowing in the 15  $\Omega$  resistor in the figure shown below :



16. Obtain the Norton's equivalent network at  $AB$  for the network shown in the figure below :



17. Explain how a high-pass  $R$ - $C$  circuit acts as a differentiator.
18. Find the equivalent inductance of two coupled coils with  $L_1$  20 mH and  $L_2$  10 mH and  $k$  0.5 when connected in (a) series aiding and (b) series opposing.

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