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C09–EC–306

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BOARD DIPLOMA EXAMINATION, (C–09)
MARCH/APRIL—2014
DECE—THIRD SEMESTER EXAMINATION

CIRCUIT THEORY

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

PART—A 3×10=30

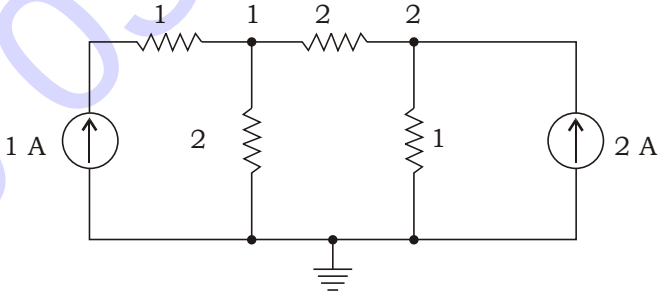
Instructions : (1) Answer **all** questions.
(2) Each question carries **three** marks.
(3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. A coil has an inductance of 1 H. If the current flowing through it changes at the rate of 2 A/s, what would be the voltage induced in the coil?

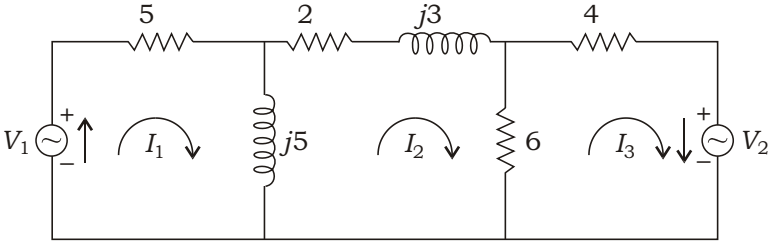
2. State the differences between active and passive circuit elements.

3. Distinguish between series and parallel resonances.

4. Write the node voltage equations required to solve the network shown below :



5. Write the mesh equations required to solve the network shown below :



6. List any three advantages of Thevenin's and Norton's theorems.

7. State the maximum power transfer theorem.

8. Two coupled coils with L_1 20 mH, L_2 10 mH and k 0 5 are connected in series aiding. Find their equivalent inductance.

9. Mention the use of differentiator and integrator circuits.

10. Define the term linear wave shaping.

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)* Derive expression for the resonant frequency of a series resonant *R-L-C* circuit. 3

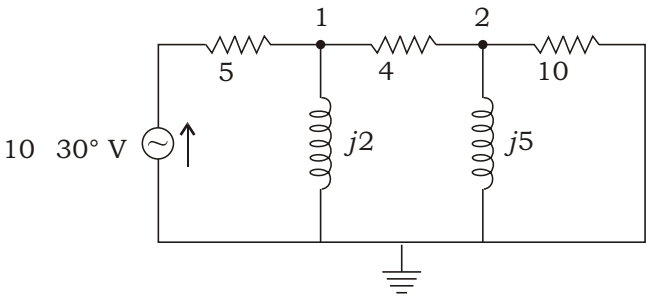
(b) Define bandwidth and selectivity. 4

(c) Plot the frequency versus current variation curve. 3

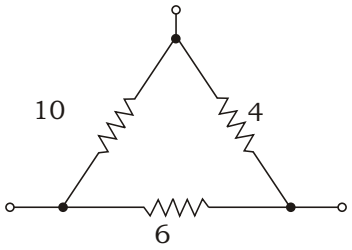
12. *(a)* Draw and write the expression for the resonant frequency of the following parallel circuits : 5
(i) L, C, (ii) R-L, C and *(iii) L, C-R*

(b) Find the total current to the parallel circuit with L 0 05 H and C 0 667 F with an applied voltage of v 200 sin 5000t V. 5

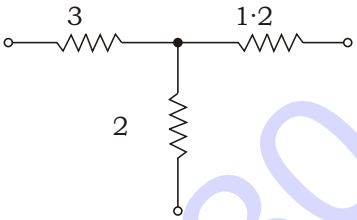
13. Determine the voltage of nodes 1 and 2 in the network shown below using input and transfer admittances : 10



14. *(a)* Convert the delta network shown in the figure to an equivalent star network : 5

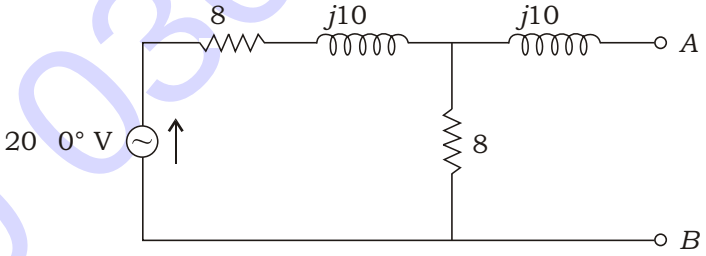


(b) Convert the star network shown in the figure to an equivalent delta network : 5

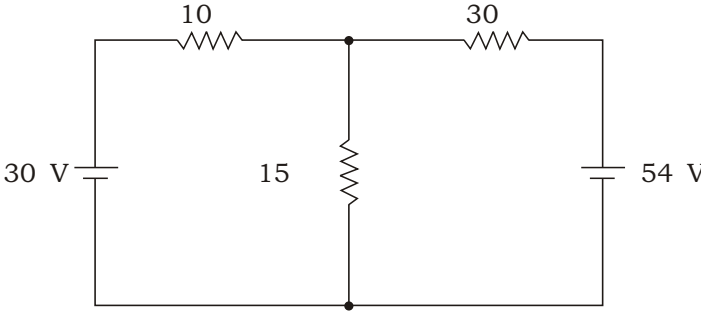


15. *(a)* Explain ideal voltage source and ideal current source briefly. 2

(b) Obtain Thevenin's equivalent circuit at the terminals *A*, *B* for the circuit shown in the figure : 8



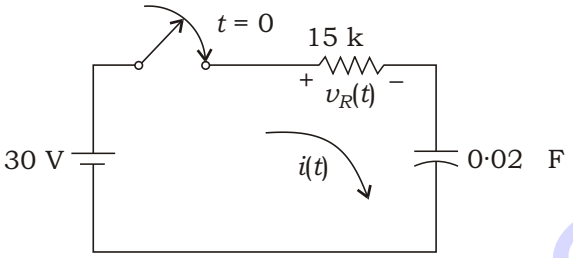
16. Using the superposition theorem, find the current flowing in the 15 resistor shown in the figure : 10



17. For the circuit shown below :

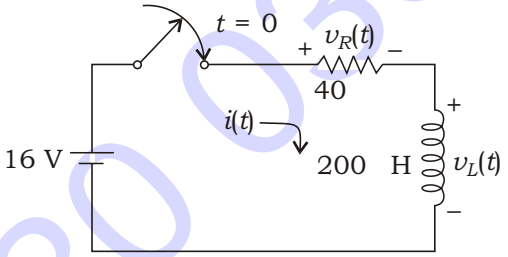
(a) Find the time constant; 2

(b) After how many time constants will the current have decayed to one-half of its maximum value? 4



(c) Explain the terms steady state and transient state briefly. 4

18. *(a)* The switch in the following figure is closed at t 0. Write the mathematical expressions for $V_L(t)$, $i(t)$ and $V_R(t)$ after the switch is closed. 8



(b) Draw *(i)* high-pass *R-C* circuit and *(ii)* low-pass *R-C* circuit. 2

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