B.Tech Odd Semester (CBCS) Exam., December—2016

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

(3rd Semester)

Course No. : ETC-305

(Circuit Theory and Network Analysis)

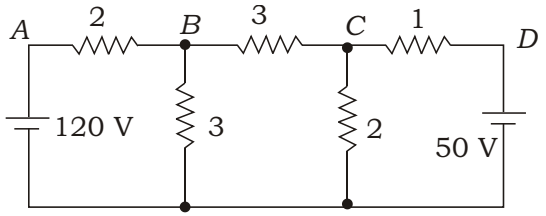
Full Marks : 75
Pass Marks : 30

Time : 3 hours

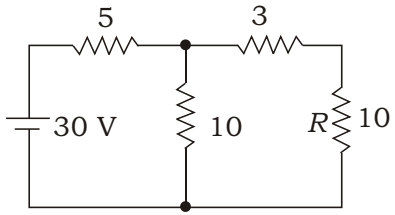
Note : 1. Attempt **one** question from each Unit.
2. Begin each answer in a new page.
3. Answer parts of a question at a place.
4. Assume reasonable data wherever required.
5. The figures in the margin indicate full marks for the questions.

UNIT—I

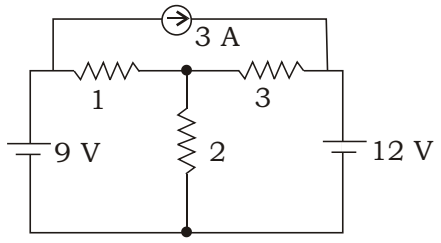
1. *(a)* Determine the voltages at nodes *B* and *C* in the network shown in figure below : 8



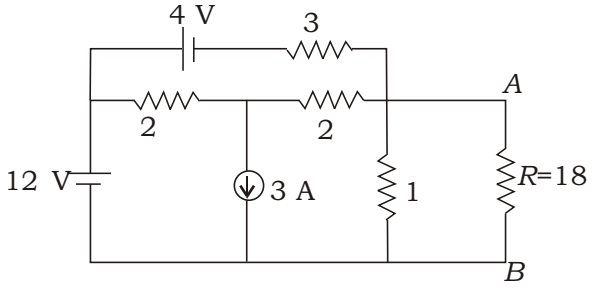
(b) Using Thevenin's theorem, find the current through the resistance *R* and the voltage across it, for the network shown in figure below : 7



2. *(a)* Find the loop currents in the network shown in figure below by using mesh method. 8



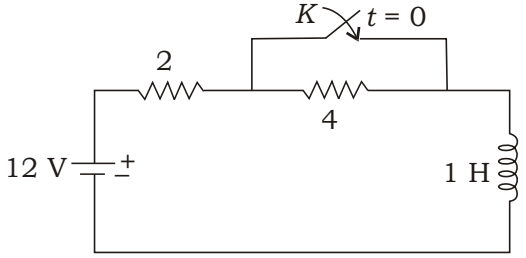
(b) Determine the value of *R* for maximum power transfer. Calculate the maximum power through *R* : 7



UNIT—II

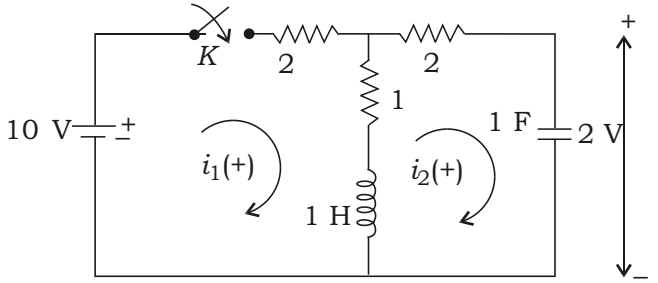
3. *(a)* A coil of resistance 12 and inductance 18 H is suddenly connected to a DC supply of 30 V. Calculate *(i)* the initial rate of change of current, *(ii)* the time constant, *(iii)* the current after 3 s, *(iv)* the energy stored in the magnetic field at t 3 s and *(v)* the energy lost as heat at t 3 s 10

(b) In figure below, the d.c. voltage is applied to the circuit keeping the switch K open so that steady state is reached. Determine the complete response for the circuit after closing the switch K. 5



4. *(a)* For the circuit shown in figure below, find $i_1(t)$ and $i_2(t)$. The initial voltage across the capacitor is 2 V and initial

current through the inductor and capacitor is zero. 10



(b) A capacitor of 10 F is connected to a DC supply through a resistance of 1 1 M . Calculate the time taken for the capacitor to reach 90% of its final charge. 5

UNIT—III

5. *(a)* Synthesize the *R-L* driving point impedance :

$$Z(s) \quad \frac{3(s \quad 2)(s \quad 3)}{(s \quad 4)(s \quad 5)}$$

to get *(i)* the Foster first form and *(ii)* the Cauer second form of realization. 8

(b) An *R-L-C* parallel circuit has R 1 k , L 10 mH, C 15 F. If a voltage of

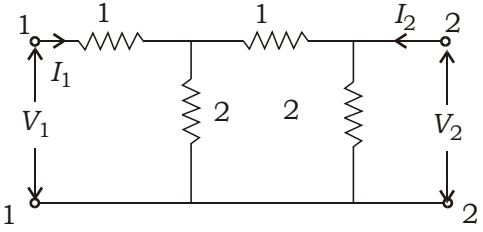
100 V is applied across the parallel combination, determine—

(i) resonant frequency;

(ii) *Q*-factor;

(iii) half-power frequencies. 7

6. *(a)* For the network shown in figure below, derive the open-circuit impedance parameters and draw its equivalent circuit : 5

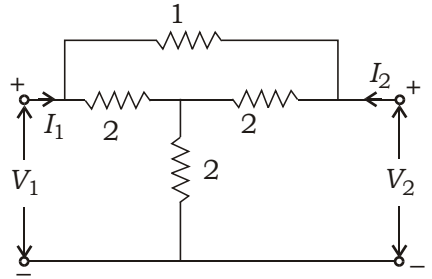


(b) Write short notes on PI and PID controller. 5+5=10

UNIT—IV

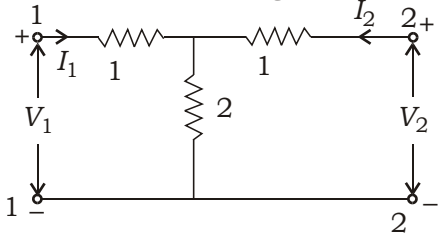
7. *(a)* Write short notes on Butterworth and Chebyshev type low-pass filter. 5+5=10

(b) Find the *Y*-parameter of the network shown in figure below : 5



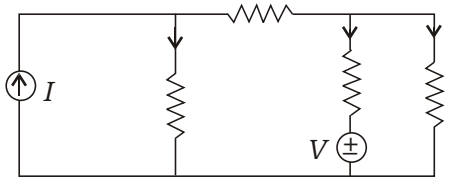
8. *(a)* Write short notes on low-pass, high-pass, band-pass and band-reject filters. 10

(b) Find the *Z*-parameter for the two-port network shown in figure below : 5



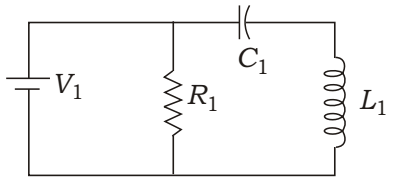
UNIT—V

9. *(a)* Draw the graph of the network shown in figure below and draw and indicate the number of all possible trees of the network. 5

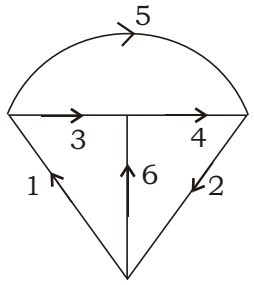


(b) Design an L-type attenuator to operate into a resistance of 500 and to provide an attenuation of 15 dB. 5

(c) Draw the dual of the network in figure below : 5



10. *(a)*



For the graph shown above, write the incidence matrix, cut-set matrix and tie-set matrix. Also draw and indicate the possible trees and co-tree of the graph. 10

(b) Write a short note on attenuators. 5

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