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B. Tech.
(SEM. III) THEORY EXAMINATION 2017-18
NETWORK ANALYSIS AND SYNTHESIS

Time: 3 Hours

Total Marks: 70

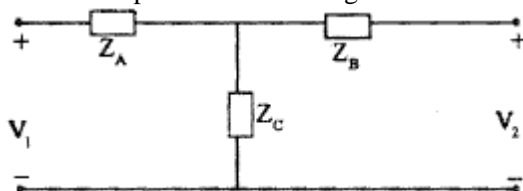
Note: 1. Attempt all Sections. Assume missing data if any.

SECTION A

1. Attempt all questions in brief.

2 x 7 = 14

- a. Write two properties of Complete Incidence matrix.
- b. Write Hybrid parameters in terms of Z parameters.
- c. State two properties of the R-L driving point Impedance function
- d. Describe the following: Tree, Co-Tree, Twig, Link, Cut-set and Tie set.
- e. State and describe the properties of RL and RC DPI Network.
- f. State and describe thevenin theorem with suitable example.
- g. Describe complex frequency in brief.
- h. Write the Z parameters for the given network.



SECTION B

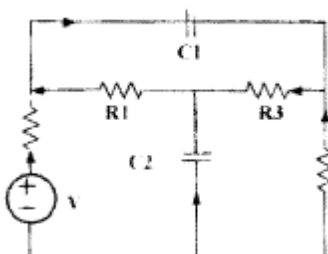
2. Attempt any three of the following:

7 x 3 = 21

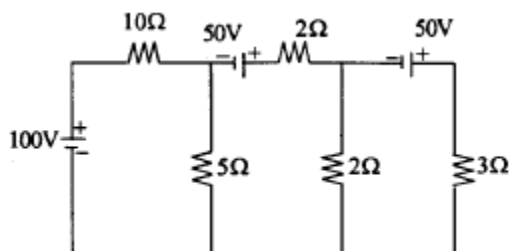
- a. For the given reduced incidence matrix. Draw the graph and hence obtain the f-cutset matrix

$$\begin{bmatrix} 0 & 0 & 1 & 1 & 1 & 0 & -1 \\ 0 & 1 & 0 & 0 & -1 & 1 & 1 \\ -1 & 0 & 1 & 0 & 0 & -1 & 0 \end{bmatrix}$$

- b. For the network shown in Fig below draw the directed graph. And also find number possible tree.



- c. Find current through 50 resistor using Thevenin's theorem.

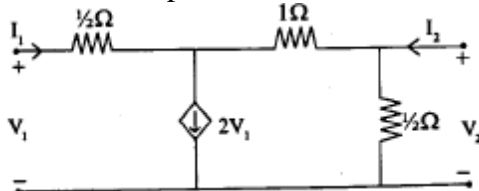


- d. Test whether the polynomial $P(s)$ is Hurwitz or not.

(i) $s^5 + 3s^2 + 2s$

(ii) $s^4 + 5s^3 + 5s^2 + 4s + 10$

- e. Find Y and Z parameters of the network.



SECTION C

3. Attempt any *one* part of the following:

7 x 1 = 7

- (a) State the properties of RL driving point impedance function. Also realize the given network impedance function using Foster form I
 $Z(s) = \frac{(s+1)(s+3)}{(s+2)(s+4)}$
- (b) Explain the advantage of active filter in comparison to passive filter in detail.

4. Attempt any *one* part of the following:

7 x 1 = 7

- (a) For the given network function, draw the pole zero diagram and hence obtain the time response $I(t)$

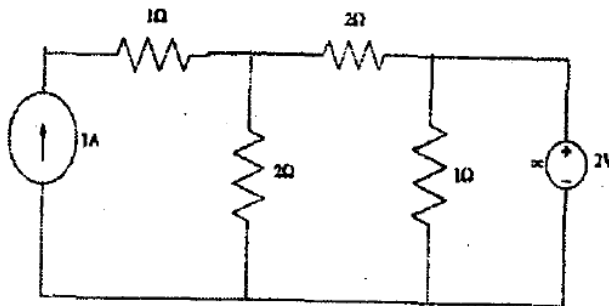
$$I(s) = \frac{5s}{(s+1)(s^2 + 4s + 8)}$$

- (b) Design constant K low pass T and π section filters to be terminated in 600 Ω having cut-off frequency 3 kHz.

5. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Determine the currents in all the branches of the network shown in fig.S using node analysis method of the graph theory.

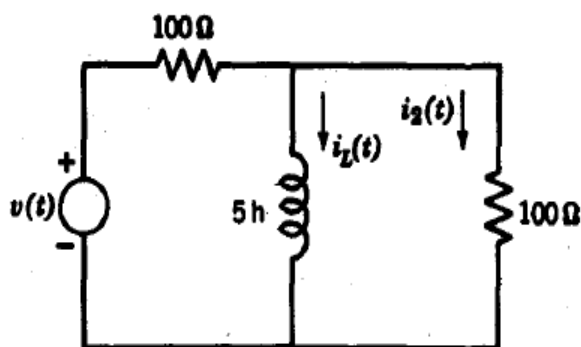


- (b) Explain following terms in context to network topology
- Tree
 - Co-tree
 - Incidence matrix
 - Oriented graph
 - Twig and link

6. Attempt any *one* part of the following:

7 x 1 = 7

- (a) Sketch the following signals:-
- $t^2[U(t-1)-U(t-3)]$
 - $(t-4)[U(t-1)-U(t-4)]$
- (b) In the circuit shown $v(t) = 2u(t)$ and $i_L(0^-) = 2$ amps. Find and sketch $i_2(t)$.



7. Attempt any *one* part of the following:

7 x 1 = 7

- State and prove the maximum power transfer theorem applied to the AC circuits.
- Determine the current in capacitor C by the principle of superposition of the network shown below

