Printed Pages: 03   **Sub Code: NEE402**

Paper Id: | 120410 | **Roll No.** | | | | | | | | | | |

B. TECH
(SEM. IV) THEORY EXAMINATION 2017-18
NETWORK ANALYSIS AND SYNTHESIS

Time: 3 Hours   *Total Marks: 100*

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

SECTION A

1.   **Attempt *all* questions in brief.**   **2 x10 = 20**

a.   Define tree and co-tree?
b.   Write a short note on tie-set matrix and cut-set matrix.
c.   Write the statement of the Thevenin's and Norton's theorem.
d.   State Tellegen's theorem.
e.   What do you mean by driving point Impedance and driving point Admittance?
f.   Write the time constants of RC and RL networks.
g.   Mention the necessary and sufficient condition for the location of poles and zeros in driving point function.
h.   A two-port network is characterized by $V_1=10I_1+5I_2$ and $V_2=5I_1+12I_2$. Find the transmission parameters A and C.
i.   What do you mean by network synthesis? How is it different from network analysis?
j.   Draw the ideal characteristics of low pass, high pass, band pass and band elimination filters.

SECTION B

2.   **Attempt any *three* of the following:**   **10 x 3 = 30**

a.   The reduced incidence matrix is given below. Do the following:

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

(i)   Draw the graph
(ii)   How many trees are possible and
(iii) Write Tie-set and Cut-set matrix

b.   State and explain "Maximum Power Transfer Theorem" in ac network. Also mention its applications and drawbacks.
A loudspeaker is connected across the terminals A and B of the circuit shown in figure-1. What should be the impedance of the speaker to obtain the maximum power transferred to it and what is the maximum power.
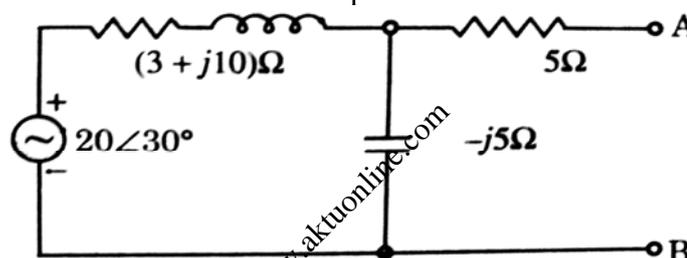

Figure 1

c. Find the initial and final values, if they exist, of the signals with Laplace transform given below:

(i) $F(s) = \dfrac{s+10}{s^2+8s+2}$ (ii) $F(S) = \dfrac{s^2+5s+7}{s^2+3s+2}$

d. Determine the expression for z-parameters of Lattice network. Also derive transmission parameters in terms of hybrid parameters.

e. Synthesize the following network function in cauer-2 form:

$$Z(s) = \dfrac{8s^3+10s}{5+6s^2+s^4}$$

SECTION C

3. Attempt any one parts of the following: **10 x 1 = 10**

a. (i) Write down the fundamental loop matrix of the network shown in figure-2.
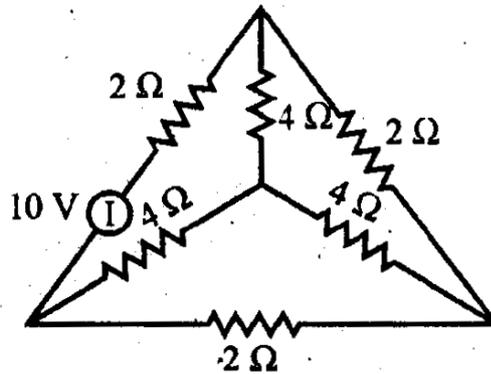

Figure 2

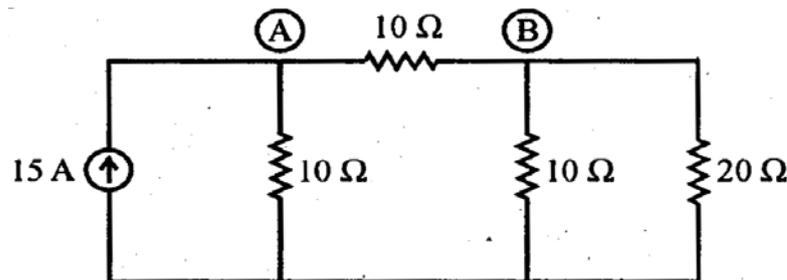(ii) Using graph theory, find node voltage at (A) and (B) for the network shown in figure-3.

Figure 3

b. What do you mean by "GRAPH" and "ORIENTED GRAPH" in circuit theory? What are the advantages and disadvantages of graph theory approach over conventional approaches? Also derive the KCL and KVL using graph theory.

4. Attempt any one parts of the following: **10 x 1 = 10**

a) Write the statement of superposition theorem. Using the superposition, determine the current, through 5Ω resistor in circuit shown in figure-4:
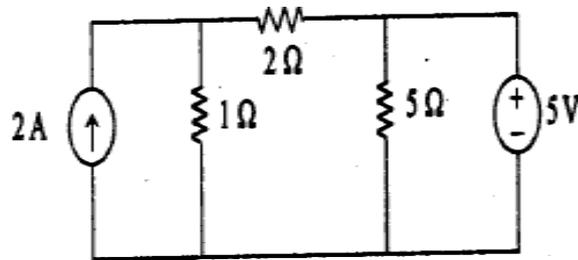
Figure 4

b) State and explain "COMPENSATION THEOREM" and "TELLEGEN's THEOREM" in circuit theory. Also mention their significances and limitations. What are the advantages and disadvantages of Tellegen's and Reciprocity theorems?

5. Attempt any one parts of the following: 10 x 1 = 10

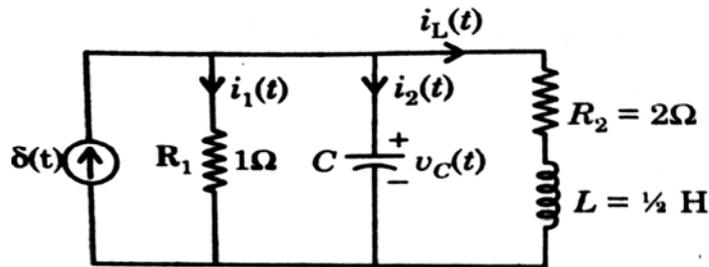a) Find the $V_c(t)$ and $i_L(t)$ in the circuit of figure-5, assuming zero initial conditions.

Figure 5

b). Find the transient time responses of (a) series R-L-C, (b) series R-C circuits having DC excitation.

6. Attempt any one parts of the following: 10 x 1 = 10

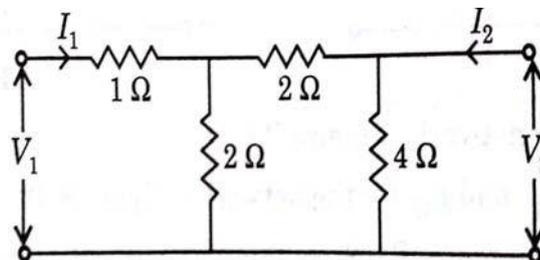a) Find out the ABCD parameters of the network shown in figure-6. Also find the image impedances for the network.

Figure 6

b) (i) Find the number of closed loop poles in the left half s-plane for a system whose characteristic equation is $S^4+2S^3+3S^2+4S+5=0$. Comment on stability of the system.

(ii) What are poles and zeroes? How does the location of poles in the s-plane affect the system stability? Explain

7. Attempt any one parts of the following: 10 x 1 = 10

a) The driving point Impedance of a one-point LC N/W is given by:

$$Z(s) = \frac{2(s^2+9)(s^2+16)}{s(s^2+4)}$$

Obtain the foster from of LC N/W realization.

b) What do you mean by "ACTIVE" and "PASSIVE" filters? What are the advantages and disadvantages of active filters over passive filters? Discuss the different types of active and passive filters.

CORRECTION IN NEE 402 SCETION B 23.05.2018 MORNING SHIFT

Q2(C) Equations are

$$F(s)=\frac{S+10}{S^2+3S+2}$$

$$F(s)=\frac{S^2+5S+7}{S^2+3S+2}$$

Q2(e) Equation is

$$Z(s)=\frac{8S^3+10S}{5+6S^3+S^4}$$

Q7(a) Equation is

$$Z(s)=\frac{2\left(S^2+9\right)(S^2+16)}{S(S^2+4)}$$