(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 121406   Roll No.⎸ ⎸ ⎸ ⎸ ⎸ ⎸ ⎸ ⎸ ⎸ ⎸ ⎸

B.Tech.

(SEM. IV) THEORY EXAMINATION 2013-14

NETWORK ANALYSIS & SYNTHESIS

Time : 3 Hours   *Total Marks : 100*

Note :– Attempt **all** questions. Each question carries equal marks.

1. Answer any **two** parts of the following :   (10×2=20)

    (a) (i) 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 ?

        (ii) Derive the KCL and KVL using graph theory.

    (b) The fundamental cut-set matrix is given as :

CUT-SET/	TWIGS				LINKS		
BRANCHES	1	2	3	4	5	6	7
C_1	1	0	0	0	-1	6	7
C_2	0	1	0	0	1	0	1
C_3	0	0	1	0	0	1	1
C_4	0	0	0	1	0	1	0

    (i) Draw and explain the oriented graph of the network.

(ii) Determine the "INCIDENCE MATRIX" of the network.

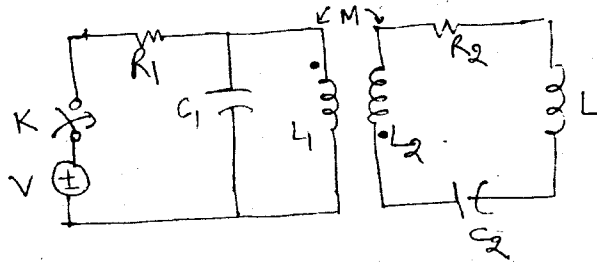(c) Consider the network shown in **Fig. 1 and 2**.
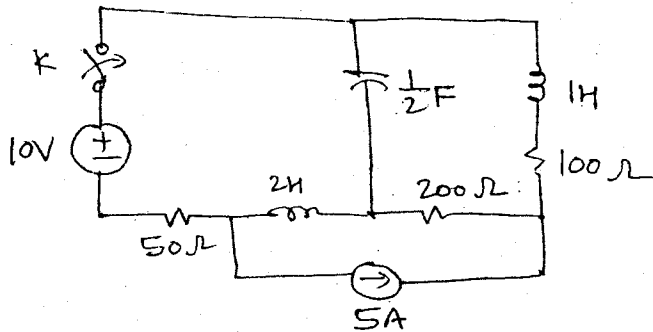

Fig. 1. network

Fig. 2. network

Draw and explain the dual of the networks shown in Fig.(1) and (2).

2. Answer any **two** parts of the following : (10×2=20)

(a) Explain why "SUPER-POSITION THEOREM" is not applicable for power and energy verifications of a given networks ? Explain the following :

(i) LINEARITY PRINCIPLE

(ii) HOMOGENEITY PRINCIPLE.
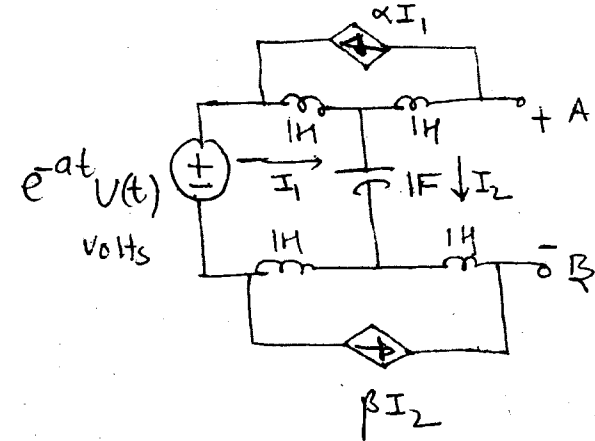
(b) Consider the network shown in **Fig. 3**.

Fig. 3

Find the Thevenin's equivalent circuit across the AB-terminals of network. Also find Norton's equivalent circuit across the AB-terminals of same network from Thevenin's equivalent circuit.
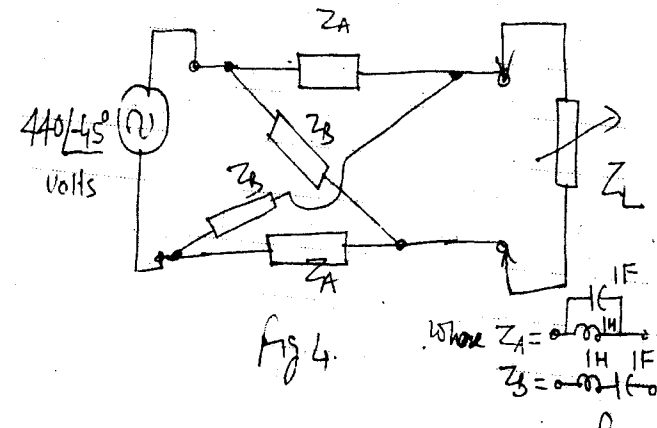
(c) Consider the network showin in **Fig. 4**.

Fig. 4.

(i) What should be the value of Z_L for maximum power transfer from source to load in network shown in **Fig. 4**?

(ii) What is the value of maximum power transfer from source to load in network shown in **Fig. 4**?

3. Answer any **two** parts of the following : **(10×2=20)**

(a) What do you mean by "POLES" and "ZEROS" of a given network transfer function ? What are the significances and limitations of network transfer functions ? Explain the complex frequency in circuit theory.
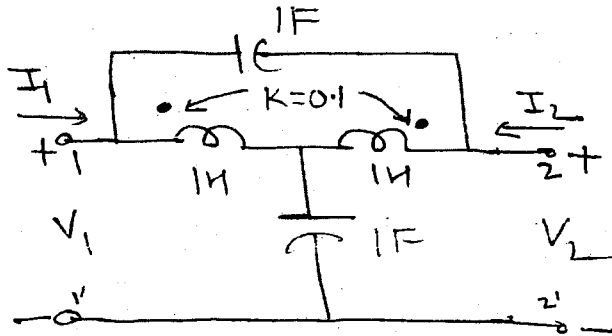
(b) Consider the network shown in **Fig. 5**.

Fig. 5

Find $\dfrac{V_2}{V_1}$ for network shown in **Fig. 5**. Also draw and

explain the pole zero diagram of $\dfrac{V_2}{V_1}$ and check its absolute

stability of network.
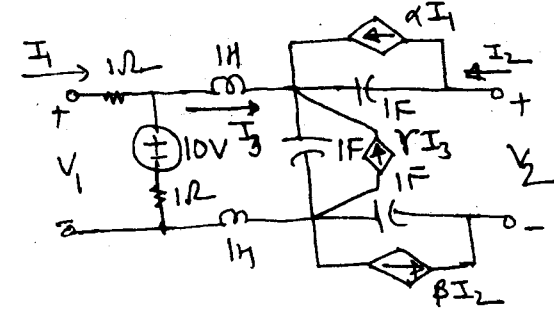
(c) Consider the network shown in **Fig. 6**.

Fig. 6

(i) Find $\alpha_{21}(s)$ & $G_{21}(s)$

(ii) Find $Y_{12}(s)$ & $Z_{12}(s)$

4. Answer any **two** parts of the following : **(10×2=20)**
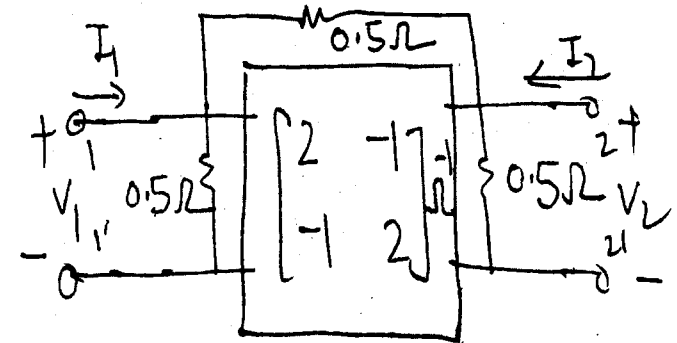
(a) Consider the network shown in **Fig. 7**.

Fig. 7

(i)   Determine I_1 & I_2 in function of V_1 and V_2.

(ii) Determine V_1 & V_2 in function of I_1 and I_2.

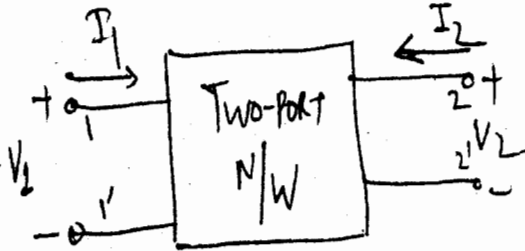(b) Consider the network equations shown in **Fig. 8**.

Fig. 8

Where

$I_1 = 5V_1 + V_2$
$I_2 = -V_1 + 5V_2$

Determine the [h] & [g]- parameters of two-port network shown in **Fig. 8**.

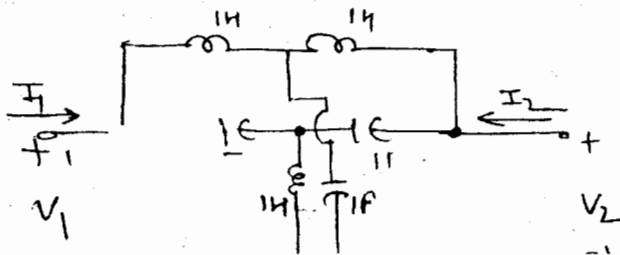(c) Consider the two-part network shown in **Fig. 9**.

Fig. 9

Determine the [z] & [y]- parameters of two-port network shown in **Fig. 9**.

5.   Answer any **two** parts of the following :   (10×2=20)

(a) What do you mean by 'POSITIVE REAL FUNCTION" ? What are the properties associated with PRF ? What are the significances of PRF ?

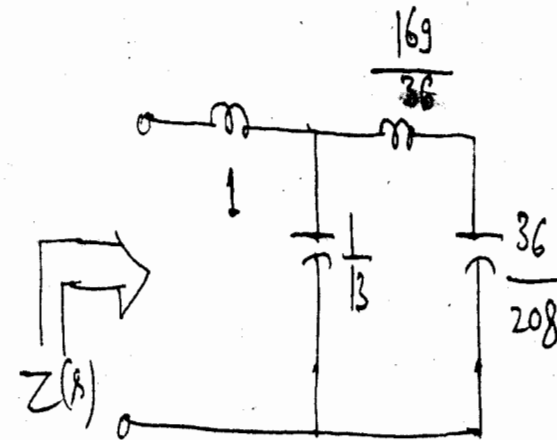(b) Consider the single port network as shown in **Fig. 10**.

Fig. 10

(i)   Determine Foster Second forms.

(ii) Determine Cauer Second forms.

(c) (i)   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.

(ii) Consider the function F(s) as follows :

$$F(s) = \frac{s^2 + \alpha s + \beta}{s^2 + \alpha's + \beta'}$$

Where α, β, α' & $\beta' \geq 0$

What should be the conditions when F(s) is PRF ?