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

PAPER ID : 2052 Roll No. | | | | | | | | | | |

B. Tech.

(SEM. IV) EXAMINATION, 2008-09

NETWORK ANALYSIS & SYNTHESIS

Time : 3 Hours] *[Total Marks : 100*

Note : Attempt all questions.

1 Attempt any **two** parts of the following :

(i) (a) Enumerate the properties of **3×2.5**

(i) Tree in a Graph

(ii) Complete incidence matrix

(iii) Path in a graph.

(b) Obtain the number of twigs and links for the graph corresponding to the network shown in **Fig. 1i(b)**. **1×2.5**

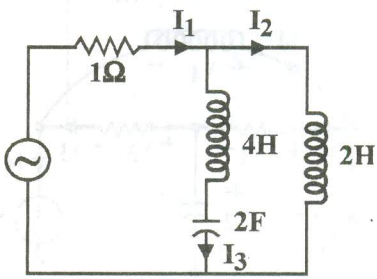

Fig. 1i(b)

(ii) (a) Draw the oriented graph of the given coupled circuit **(Fig. 1ii(a))** and develop the tie set matrix and cutset matrix. **1×5**

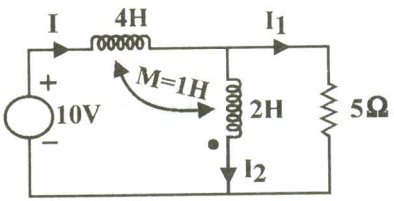

Fig. 1ii(a)

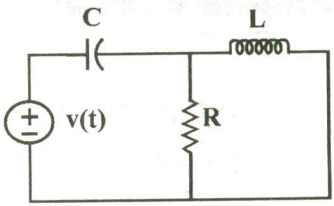

Fig. 1ii(b)

(b) Obtain the dual network of network shown in **Fig. 1ii(b)**; also define the term 'duality'. **1×5**

(iii) Consider the network shown in **Fig. 1iii,** let the resistors be 1 ohm, the capacitor 1 farad and the inductor 1 henry. Using Graph theory **1×10**

find $i_b = \begin{bmatrix} i_1 & i_2 & i_3 & i_4 & i_5 \end{bmatrix}^T$,

$v_b = \begin{bmatrix} v_1 & v_2 & v_3 & v_4 & v_5 \end{bmatrix}^T$.

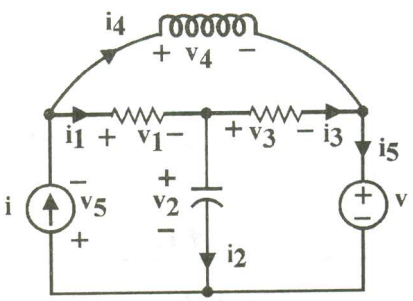

Fig. 1iii,

2 Attempt any **two** parts of the following :

(i) (a) State and prove maximum power transfer theorem for an AC circuit. **1×5**

(b) Find the power loss in the **2 Ω** resistor using Thevenin's theorem as shown in **Fig. 2i(b)**. **1×5**

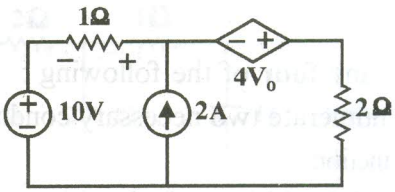

Fig. 2i(b)

(ii) Using Thevenin's theorem find the current in the ammeter *A* of resistance **3Ω** as shown in **Fig. 2ii**. **1×10**

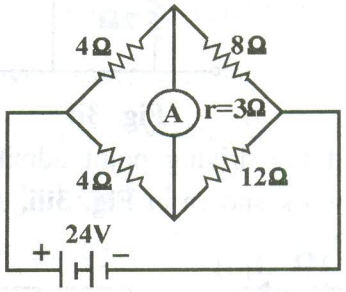

Fig. 2ii

(iii) Determine current through (3+j4) impedance in the following circuit using Millman's theorem. **1×10**

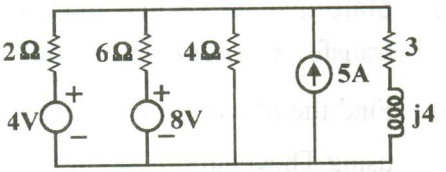

Fig. 2iii

3 Answer any **four** of the following : **4×5**

(i) Enumerate two necessary conditions for driving point function.

(ii) Find the driving point impedance for the network shown in **Fig. 3ii.** Also plot the poles and zeros of $z(s)$ on s-plane.

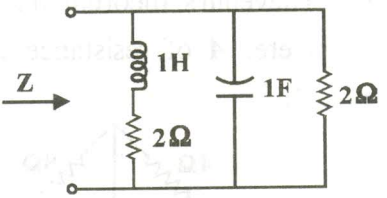

Fig. 3ii

(iii) Find the driving point admittance function for the network shown in **Fig. 3iii.**

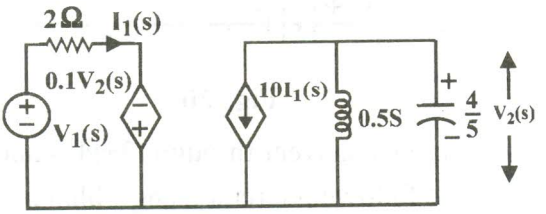

Fig. 3iii

(iv) A current transfer function is given by

$$I(s) = \frac{5s}{(s+2)(s^2+2s+2)}$$. Obtain its time response.

(v) Find the voltage transfer ratio for the network shown in **Fig. 3v.**

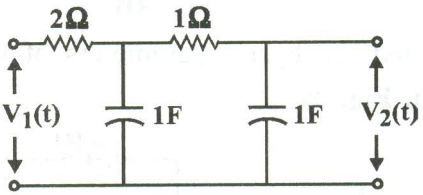

Fig. 3v

4 Answer any **four** of the following : **4×5**

(i) Obtain the condition of Symmetry and Reciprocity in terms of h-parameters.

(ii) Prove that in a parallel-parallel interconnected two networks with admittance matrix $[Y_A]$ and $[Y_B]$ respectively, the overall Y-matrix is given as $[Y] = [Y_A] + [Y_B]$.

(iii) Obtain z-parameter of the network shown in **Fig. 4iii**.

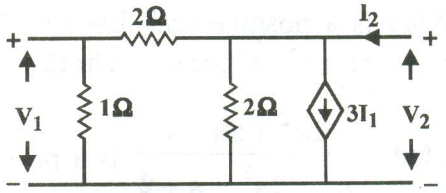

Fig. 4iii

(iv) Determine the admittance parameters of the network shown in **Fig. 4iv**.

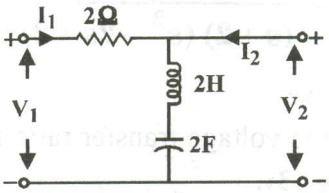

Fig. 4iv

(v) Find the hybrid parameters of the network shown in **Fig. 4v**.

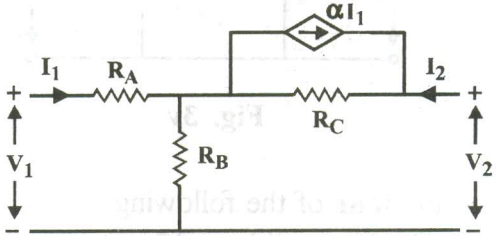

Fig. 4v

(vi) The Y-parameters of two port network are $Y_{11} = 0.5\,mho$, $Y_{22} = 0.2\,mho$, $Y_{12} = Y_{21} = -0.25\,mho$. Compute transmission parameters.

5 Answer any two of the following : **2×10**

(a) What is a positive real function ? Also mention its properties. Check whether the function

$$z(s) = \frac{2s^2 + 2s + 1}{s^3 + 2s^2 + s + 2}$$ is a positive real function.

(b) Find the first and second Foster form of the driving point impedance function

$$z(s) = \frac{2(s^2+1)(s^2+9)}{s(s^2+4)}.$$

(c) Design a prototype band pass filter section (T and π) having cut-off frequencies of 3000 Hz and 6000 Hz and nominal characteristics impedance of **600** Ω. Also find the resonant frequency of shunt arm or series arm.
