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TEE - 402

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

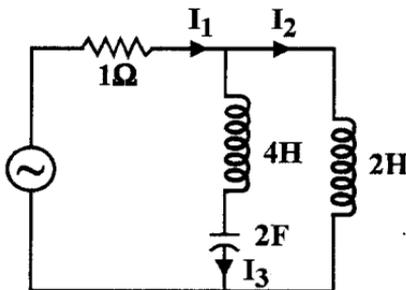
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B. Tech.**(SEM. IV) EXAMINATION, 2008-09****NETWORK ANALYSIS & SYNTHESIS***Time : 3 Hours]**[Total Marks : 100***Note :** Attempt all questions.1 Attempt any **two** parts of the following :

- (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 **1×2.5**
for the graph corresponding to the network shown in **Fig. 1i(b)**.

**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

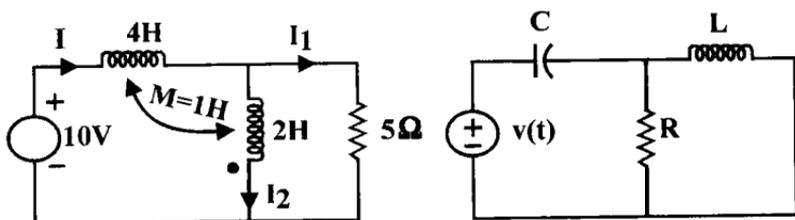


Fig. 1ii(a)

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

$$\text{find } \mathbf{i}_b = [i_1 \ i_2 \ i_3 \ i_4 \ i_5]^T,$$

$$\mathbf{v}_b = [v_1 \ v_2 \ v_3 \ v_4 \ v_5]^T.$$

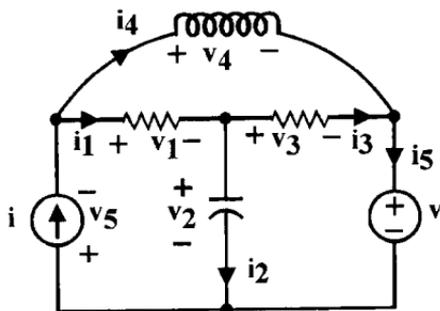


Fig. 1iii,



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 $2\ \Omega$ resistor using Thevenin's theorem as shown in Fig. 2i(b). 1×5

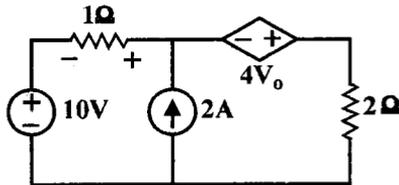


Fig. 2i(b)

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

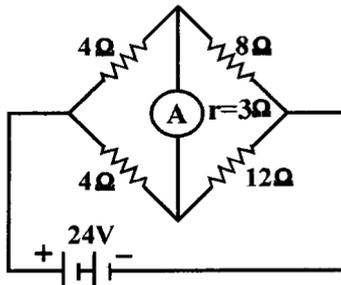


Fig. 2ii

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



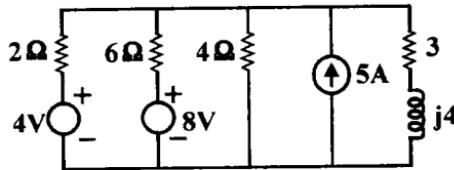


Fig. 2iii

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.

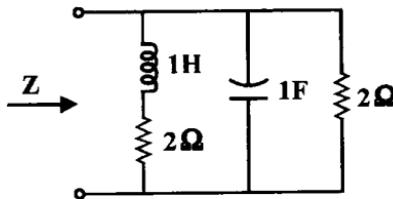


Fig. 3ii

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

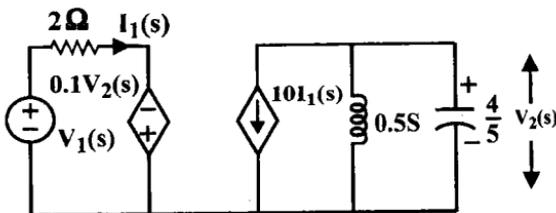


Fig. 3iii



(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.

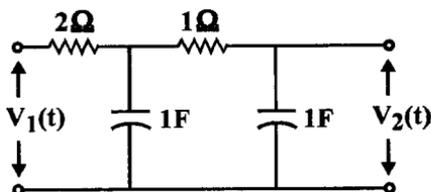


Fig. 3v

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.

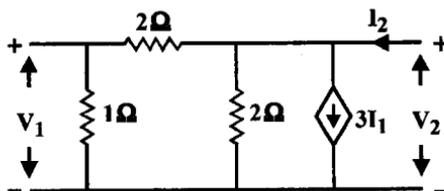


Fig. 4iii



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

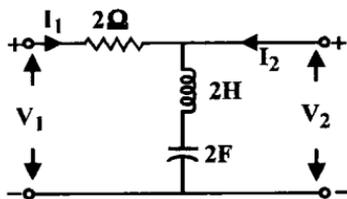


Fig. 4iv

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

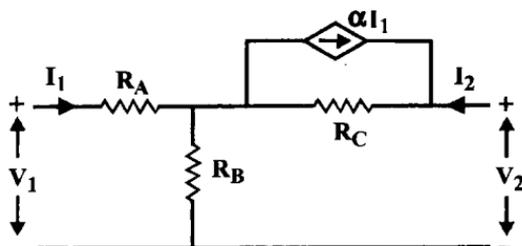


Fig. 4v

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

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



- (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.
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