Printed Pages : 7 **TEE-303**

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

PAPER ID : 2044 Roll No.

B. Tech.

(SEM. III) EXAMINATION, 2008-09

NETWORK ANALYSIS & SYNTHESIS

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

Note : *Attempt **all** questions. All questions carry equal marks. In case of numerical problems assume data wherever not provided.*

1 Attempt any **four** parts of the following : **5×4=20**

(a) Explain the duality principle with suitable example in graph theory

(b) Obtain the fundamental loop and fundamental cutset matrices for the graph given in **Fig. 1 (b)**.

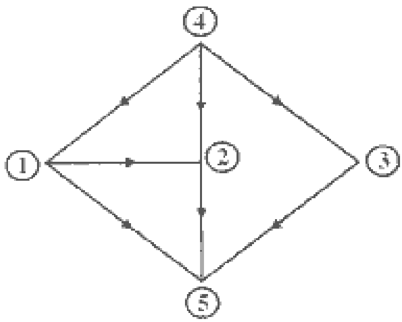

Fig. 1 (b)

(c) Determine the number of branches, number of nodes and number of links. Also develop network equilibrium equation of the network given in **Fig. 1 (c)**.

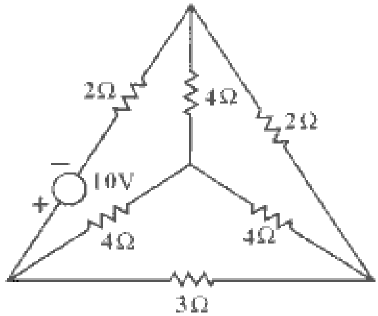

Fig. 1 (c)

(d) Derive the relation between branch current matrix and loop current matrix.

(e) Differentiate between subgraph and connected graph. Enlist the properties of incidence matrix in a graph.

(f) A resistive network is shown in **Fig. 1 (f)**. Setup corresponding tie-set matrix and obtain kVL equation.

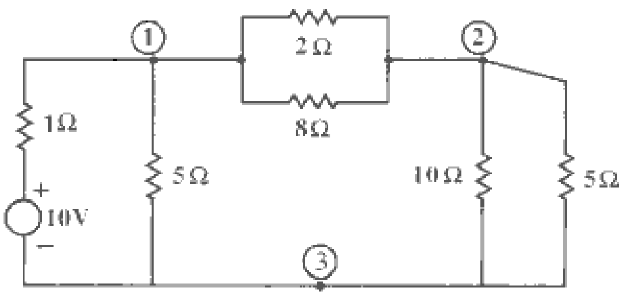

Fig. 1 (f)

2 Attempt any **three** parts of the following : $6\frac{2}{3} \times 3 = 20$

(a) Find the current in 2 Ω resistance in the network shown in **Fig. 2 (a)** using Norton's theorem.

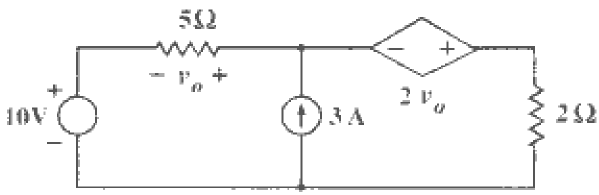

Fig. 2 (a)

(b) Using Millman's theorem, find the current through $(4 + j3)\,\Omega$ in the network shown in **Fig. 2 (b)**.

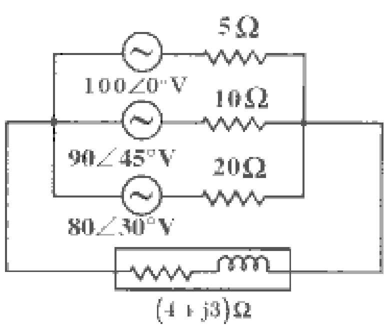

Fig. 2 (b)

(c) In the network of **Fig. 2 (c)** find the maximum power in $(6 + j8)\ \Omega$.

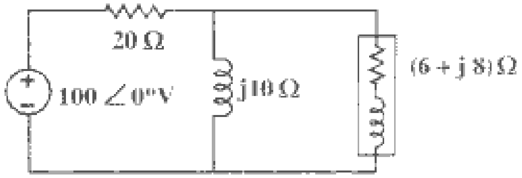

Fig. 2 (c)

(d) Determine the current in the capacitor branch by superposition theorem in the current of **Fig. 2 (d)**.

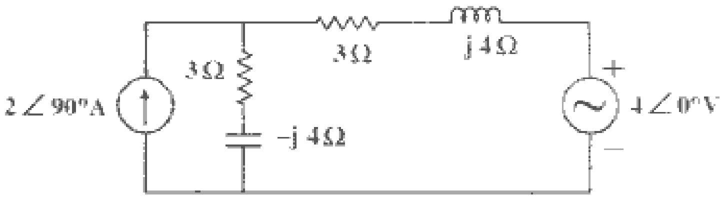

Fig. 2 (d)

(e) State and explain compensation theorem in ac network.

3 Attempt any **two** parts of the following : **10×2=20**

(a) Check the stability criteria of the following polynomial by applying Routh-Hurwitz criterion :

(i) $P(s) = s^6 + 3s^5 + 4s^4 + 6s^3 + 5s^2 + 3s + 2$

(ii) The characteristic equation of a feedback control system is

$$s^4 + 20ks^3 + 4s^2 + 10s + 15 = 0$$

Find the range of k for the system to be stable.

(b) Draw the pole-zero diagram of given network function and hence time domain response $i(t)$.

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

(c) Enlist the properties of transfer function of a network. Obtain the driving point immittance of the network shown in **Fig. 3 (c).**

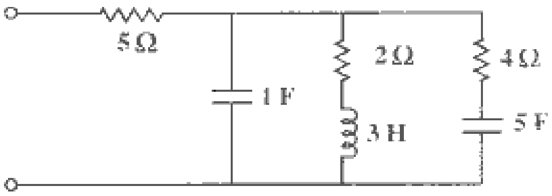

Fig. 3 (c)

4 Attempt any **two** parts of the following : 10×2=20

(a) Obtain the z-parameters of the network shown in **Fig. 4 (a)**.

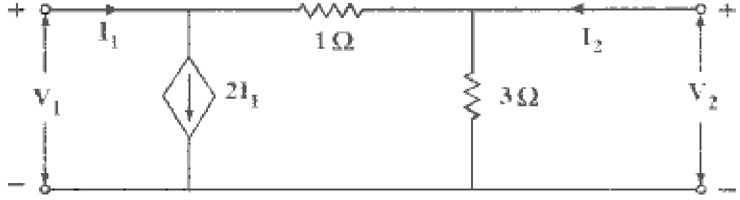

Fig. 4 (a)

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(b) Determine Y-parameters of two-part network shown in **Fig. 4 (b)**.

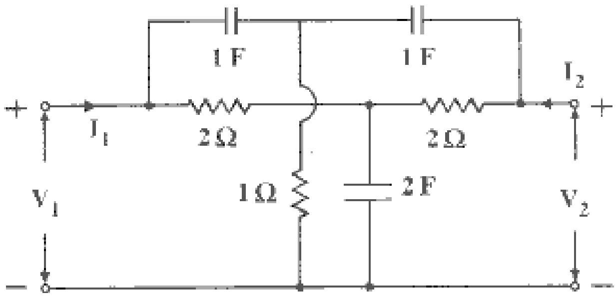

Fig. 4 (b)

(c) Determine lattice equivalent of the network shown in **Fig. 4 (c).**

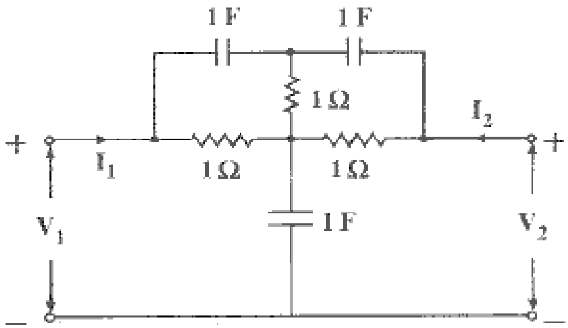

Fig. 4 (c)

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

(a) Develop the Foster-II and Cauer-I network for the given function :

$$z(s) = \frac{s^5 + 5s^3 + 3s}{s^4 + 3s^2 + 1}$$

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(b) Enlist the properties of positive real function. Also determine whether the given polynomials are hurwitz or not :

(i) $s^4 + 7s^3 + 4s^2 + 18s + 6$

(ii) $s^5 + s^3 + 5$

(c) Enlist the properties of a filter.

Design an m-derived low pass filter having design resistance $R_0 = 500\,\Omega$, cut-off frequency $f_c = 1500\,Hz$ and infinite attenuation frequency $f_\infty = 2000\,Hz$.

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