



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

PAPER ID : 2044Roll No. **B. Tech.****(SEM. III) EXAMINATION, 2008-09
NETWORK ANALYSIS & SYNTHESIS**

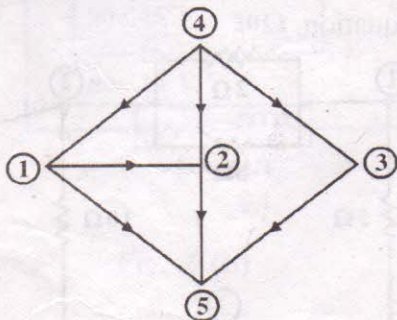
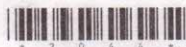
Time : 3 Hours]

[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).

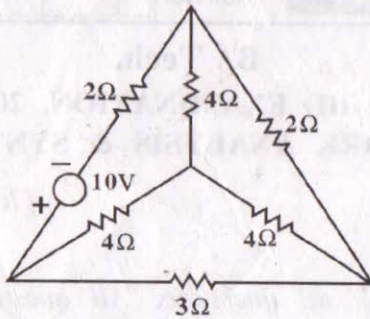


Fig. 1 (c)

- (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.

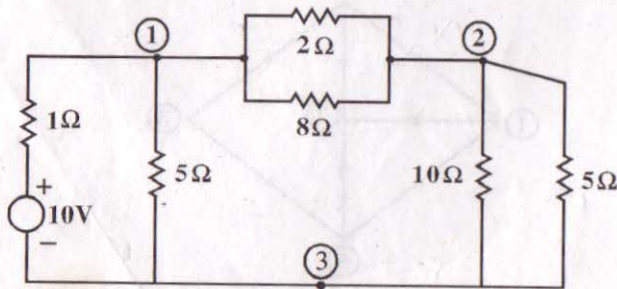


Fig. 1 (f)

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

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

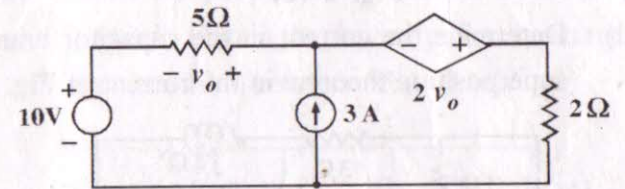


Fig. 2 (a)

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

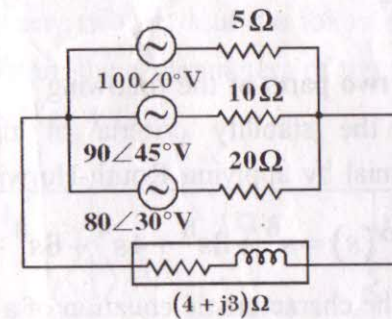


Fig. 2 (b)



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

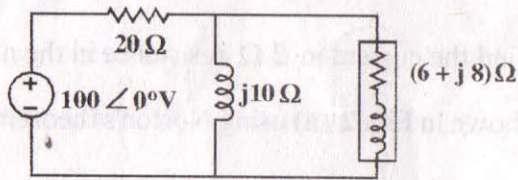


Fig. 2 (c)

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

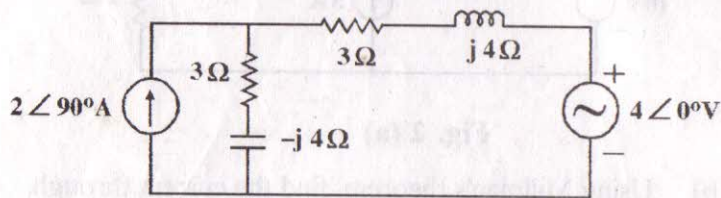


Fig. 2 (d)

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

3 Attempt any **two** parts of the following : $10 \times 2 = 20$

- (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).

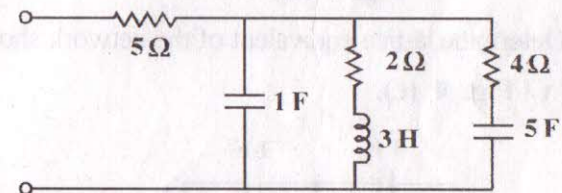


Fig. 3 (c)

4 Attempt any **two** parts of the following : $10 \times 2 = 20$

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

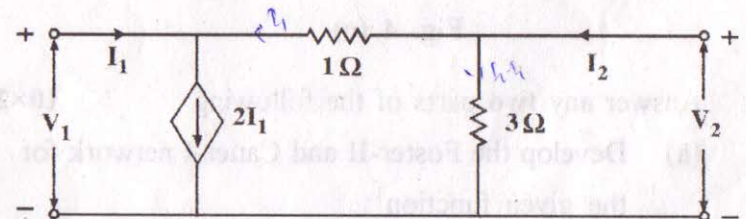


Fig. 4 (a)



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

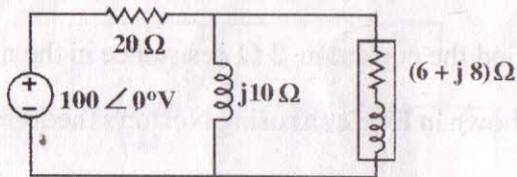


Fig. 2 (c)

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

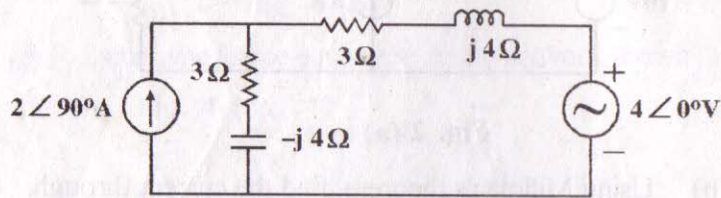


Fig. 2 (d)

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

3 Attempt any **two** parts of the following : $10 \times 2 = 20$

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

(i) $s^4 + 7s^3 + 4s^2 + 18s + 6$ (not)

(ii) $s^5 + s^3 + 5$ (not)

- (c) Enlist the properties of a filter.

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

