[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2125)

15103

B. Tech 4th Semester Examination

Network Analysis and Synthesis (OS)

EC-4004

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Section E is Compulsory. Attempt other four questions, selecting one from each section A, B, C, D.

SECTION - A

1. Steady state conditions exist at t=0(-) and switch S is closed at t=0 in Fig. 1. Find $i_a(t)$ and $i_b(t)$. Using Laplace Transform. (20)

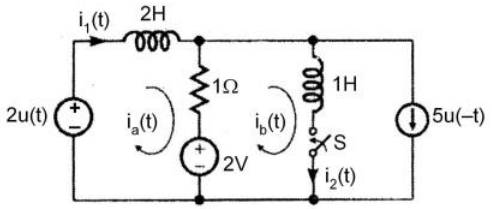

Fig. 1

2. Explain:

   (a) Three types of systems

   (b) Special Signals

   (c) Butterworth polynomial

   (d) Frequency normalization (20)

[P.T.O.]

SECTION - B

3. For the network shown in Fig. 2, calculate Y and T parameters with 3Ω load across port 2. (20)

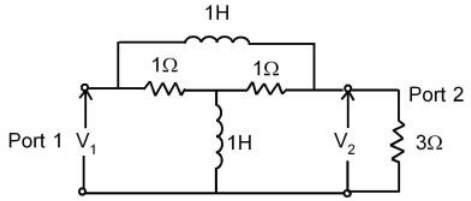

Fig. 2

4. Justify Norton theorem as converse of Thevenin theorem. Find I_1 and I_2 in the circuit shown in Fig. 3. Use superposition principle. (20)

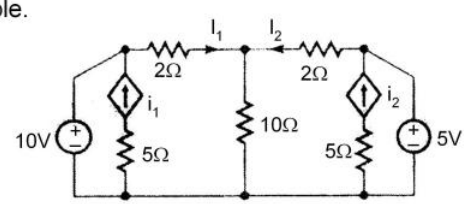

Fig. 3

SECTION - C

5. Explain cut set and tie set matrix with example. Develop fundamental cut-set matrix of the network shown in Fig. 4. (20)

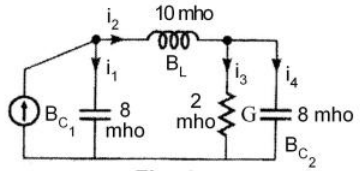

Fig. 4

6. Test whether the polynomial $P(s) = s^7 + 2s^6 + 2s^5 + s^4 + 4s^3 + 8s^2 + 8s + 4$ is Hurwitz or not. Also explain properties of Hurwitz polynomial. (20)

SECTION - D

7. Design a prototype constant-K band pass filter having cut-off frequencies of 4 KHz and 6 KHz and a nominal impedance of 628Ω. (20)

8. Synthesize $F(s) = \frac{4(s+1)(s+3)}{s(s+2)}$ using Cauer I and Cauer II form of realization when F(s) is either an impedance or admittance. (20)

SECTION - E

9. (a) Test whether $\frac{s+a}{s^2+bs+c}$ is PRF.

   (b) What is a routh criterion?

   (c) In series RLC circuit, determine value of R for critical damping, assume L=2 H, C=5 μF.

   (d) What is driving point impedance function?

   (e) What is significance of poles and zeroes?

   (f) What is characteristic impedance?

   (g) For $V(s) = \frac{(s+2)}{s(s+1)}$, the initial and final values of v(t).

   (h) When superposition theorem is applied to a circuit, how does the dependent voltage source behave?

   (i) Show the effect of increasing the filter order on the characteristic frequency response of a Butterworth low Pass filter.

   (j) What are the properties of incidence matrix?

(10×2=20)