Exam. Code: 0933
Sub. Code: 6656

2122

B.E. (Electrical and Electronics Engineering)
Third Semester
ES-EE-301: Network Analysis and Synthesis

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt <u>five</u> questions in all, including Question No. 1 which is compulsory and selecting two questions from each Part. Missing data (if any) can be appropriately assumed.*

x-x-x

1. Explain in brief.

A) How can ideal voltage sources be converted into ideal current sources and vice-versa? **(02)**

B) For a given network the complete incidence matrix is given by A_c. The number of possible trees for the oriented graph of the network are ..... . **(02)**

$A_C =$

Nodes	Branches									
	1	2	3	4	5	6	7	8	9	10
1	1	0	0	0	0	0	0	0	−1	0
2	−1	1	1	0	0	0	0	0	0	0
3	0	−1	−1	1	1	0	0	0	0	0
4	0	0	0	0	−1	1	1	0	0	0
5	0	0	0	0	0	−1	0	0	0	1
6	0	0	0	0	0	0	−1	1	0	0
7	0	0	0	−1	0	0	0	−1	1	−1

C) What do you understand by initial conditions before and after switching? **(02)**

D) What are the open-circuit impedance parameters of a two-port network? Why are they so called? **(02)**

E) A system has a pair of complex conjugate poles p_1 , $p_2 = -1 \pm j2$, a single real zero $Z_1 = -4$, and a gain factor $k = 3$. Find the differential equation representing the system. **(02)**

Part A

2. A) For the circuit of Fig. 1, apply source transformation and then find V_1 and V_2 by nodal analysis. **(05)**

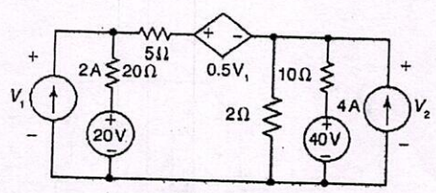

Fig. 1

B) A 3-phase 4-wire, 400-V supply is connected to an unbalanced load having phase impedances of $Z_R = (8 + j6)\ \Omega$, $Z_Y = (8 - j6)\ \Omega$, and $Z_R = 5\ \Omega$. Impedance of the neutral line is $(1 - j1)\ \Omega$. Determine the phase currents and phase voltages of the load. Ignore the impedances of the line wires and internal impedances of the generator. **(05)**

P.T.O.

3. A) For the resistive network shown in Fig. 2, write a cut-set schedule and equilibrium equations on voltage basis. Hence obtain values of branch voltages and branch currents. (05)

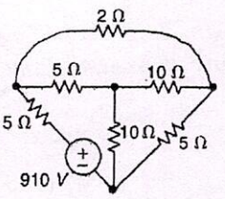

Fig.2

B) What are the two ways of connecting a 3-phase system? Also deduce the relationship between the phase and line voltages and currents in a 3-phase star-connected circuit. Draw phasor diagrams to establish it. (05)

4.A) Derive Z parameters of two-port network in-terms of g parameters. (05)

B) Show that the overall transmission parameter matrix for cascaded Two 2-port networks is simply the matrix products of transmission parameters for each individual 2-port network in cascade. (05)

PART B

5. A) Write the necessary conditions for the driving point immittance functions. (05)

B) Apply the Routh criterion to the given polynomial and determine the number of roots (i) with positive real parts, (ii) with zero real parts, and (iii) with negative real parts. (05)

$$Q(s) = s^4 + 4s^3 + 8s^2 + 12s + 15$$

6(A) Find the inverse Laplace transform of the function (05)

$$F(s) = \frac{(s+5)}{S(S^2 + 2S + 5)}$$

B) In the R-L circuit as shown, in Fig. 3, the switch is in the position 1 long enough to establish steady-state condition and at t 0 it is switched to the position 2. Find the resulting current, i(t). (05)

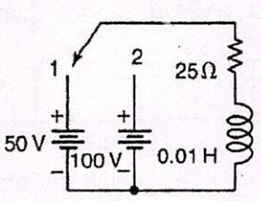

Fig.3

7. A) What do you understand by a positive real function in the context of network synthesis? State and explain clearly Sturm's theorem for testing positive realness characteristic of a network function. (05)

B) Synthesize the first and second foster forms of networks for the impedance functions: (05)

$$Z(s) = \frac{3(s+2)(s+4)}{(s+1)(s+3)}$$

x-x-x