

Code No: 133BJ

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, April/May - 2018

NETWORK ANALYSIS

(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 75

Note: This question paper contains two parts A and B. Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART-A

(25 Marks)

- 1.a) Define Coefficient of Coupling and find the coefficient of coupling for two coils having  $L_1=2\text{ H}$ ,  $L_2=8\text{ H}$  and  $M= 3\text{H}$ ? [2]
- b) Draw the impedance triangle and explain each term. [3]
- c) Define quality factor and band width of a series resonant circuit. [2]
- d) For the circuit shown in figure 1, if  $v = 10e^{-4t}\text{ V}$  and  $i = 0.2e^{-4t}\text{ A}$ ,  $t > 0$ , find R and C [3]

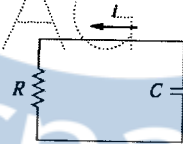


Figure 1

- e) Define the following terms related to periodic function (i) RMS Value (ii) Average Value. [2]
- f) List any three properties of Laplace-transform. [3]
- g) Write down the set of equations of a two port network in terms of ABCD parameters. [2]
- h) Define image and iterative impedance. [3]
- i) List the properties of Low Pass filter. [2]
- j) Explain about composite filters. [3]

PART-B

(50 Marks)

- 2.a) In the circuit shown in figure 2, calculate the input impedance and current  $I_1$ . Take  $Z_1 = 60 + j100\ \Omega$ ,  $Z_2 = 30 + j40\ \Omega$ , and  $Z_L = 80 + j60\ \Omega$ .

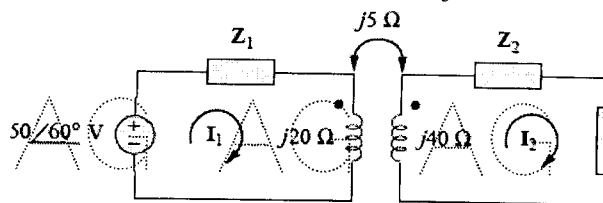


Figure 2

- b) For the network shown in figure 3 draw the oriented graph and frame the cut-set matrix. [5+5]

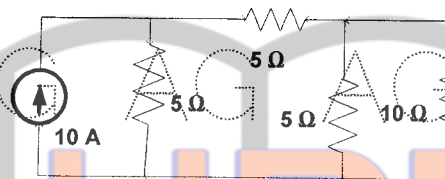


Figure 3  
OR

- 3.a) Define Graph, Tree, Basic tie set matrix and cut set matrix for a planar network with an example.  
b) Draw the oriented graph of a network with fundamental cut-set matrix as shown in figure 4. Also find number of cut-sets and draw them. [5+5]

Twigs				Links		
1	2	3	4	5	6	7
1	0	0	0	-1	0	0
0	1	0	0	1	0	1
0	0	1	0	0	1	1
0	0	0	1	0	1	0

Figure 4

- 4.a) Refer to the circuit shown figure 5 the switch is closed at  $t = 0$ . (i) determine equations for  $i_L$  and  $v_L$ . (ii) At  $t = 300$  ms, open the switch and determine equations for  $i_L$  and  $v_L$  during the decay phase. (iii) Determine voltage and current at  $t = 100$  ms and at  $t = 350$  ms. (iv) Sketch  $i_L$  and  $v_L$ .

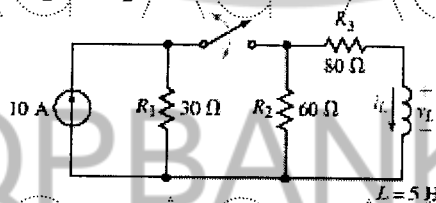


Figure 5

- b) A series resonant circuit has a bandwidth of 100 Hz and contains a 20 mH inductance and a 2  $\mu$ F capacitance. Determine (i)  $f_0$  (ii) Q (iii)  $Z_{in}$  at resonance (iv)  $f_2$ . [5+5]

OR

- 5.a) Design a series  $RLC$  circuit that will have an impedance of  $10 \Omega$  at the resonant frequency of  $\omega_0 = 100 \text{ rad/s}$  and a quality factor of 80. Find the bandwidth.
- b) Consider the circuit shown in figure 6. Find  $i(t)$  for  $t < 0$  and  $t > 0$ . [5+5]

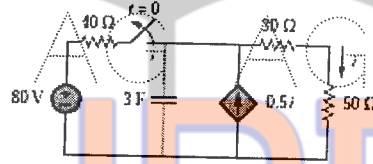


Figure 6

- 6.a) Obtain the response of R-L-C series circuit for exponential excitation. Use Laplace Transform method.
- b) Determine the RMS value of the current waveform shown in figure 7. If this current waveform is passed through  $2 \Omega$  resistor find the average power absorbed by the resistor? [5+5]

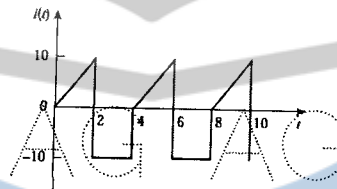


Figure 7  
OR

- 7.a) A Voltage  $V_m \sin(\omega t + \phi)$  is applied to an initially relaxed RL series circuit. Find the value of  $\phi$  for which there will be no transient current in the circuit. Use Laplace Transform method.
- b) Find the-rms value of the voltage waveform shown in figure 8. [5+5]

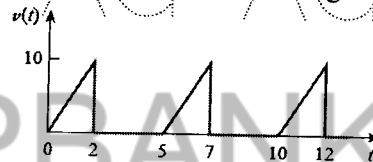


Figure 8

- 8.a) Obtain the  $y$  parameters for the circuit shown in figure 9.

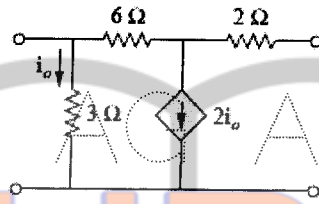


Figure 9

- b) For the network shown in figure 10 find the driving point input impedance and also plot the pole-zero patterns. [5+5]

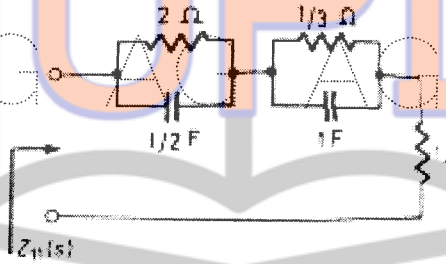


Figure 10  
OR

- 9.a) Find the transfer function  $G_{12}(s) = \frac{V_2(s)}{V_1(s)}$  for the network shown in figure 11.

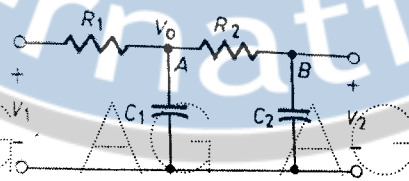


Figure 11

- b) Express hybrid parameters in terms of impedance parameters. [5+5]

- 10.a) An attenuator is composed of symmetrical T-section having series arm each of  $175 \Omega$  and shunt arm of  $350 \Omega$ . Derive expression for and calculate the characteristic impedance of this network and attenuation per section.

- b) Draw the circuit diagram of a Band pass filter? Explain the design procedure of the above filter in detail. [5+5]

OR

- 11.a) Design an asymmetrical T-attenuator to produce attenuation of 20 DB and to work between source impedance of  $400 \Omega$  and load impedance of  $900 \Omega$ .

- b) Classify the filters according to their  
i) frequency characteristics and  
ii) Depending upon the relation between series impedance and Shunt impedance. [5+5]