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 H, $L_2$=8 H and M= 3H? [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 $v = 10e^{-4t}$ V and $i = 0.2e^{-4t}$ A, $t>0$, find R and C. [3]

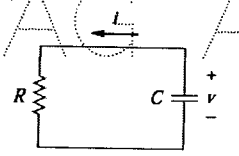


**Figure 1**

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 $\mathbf{I}_1$. Take $\mathbf{Z}_1 = 60 + j100\ \Omega$, $\mathbf{Z}_2 = 30 + j40\ \Omega$, and $\mathbf{Z}_L = 80 + j60\ \Omega$.

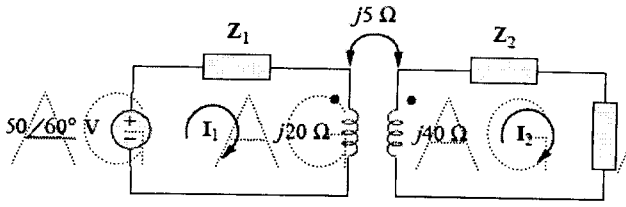


**Figure 2**

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

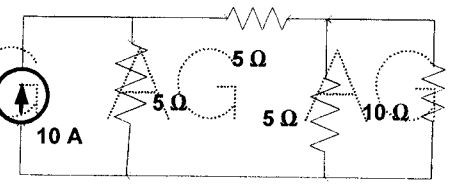


**Figure 3**

**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 $v_L$.

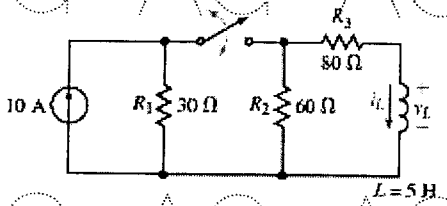


**Figure 5**

b) A series resonant circuit has a bandwidth of 100 Hz and contains a 20 mH inductance and a 2 μF capacitance. Determine (i) $f_o$ (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 Ω at the resonant frequency of $\omega_0 = 100$ 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]

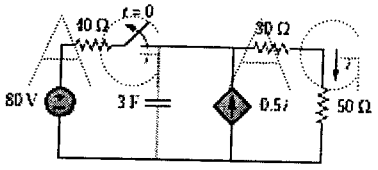


**Figure 6**

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 Ω resistor find the average power absorbed by the resistor? [5+5]

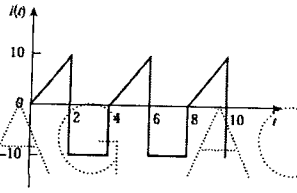


**Figure 7**

**OR**

7.a) A Voltage $V_m Sin(\omega t+\phi)$ is applied to an initially relaxed RL series circuit. Find the value of φ 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]

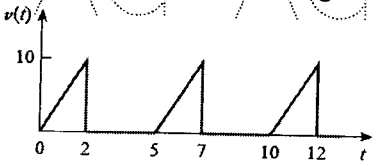


**Figure 8**

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

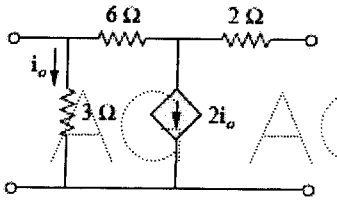


**Figure 9**

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

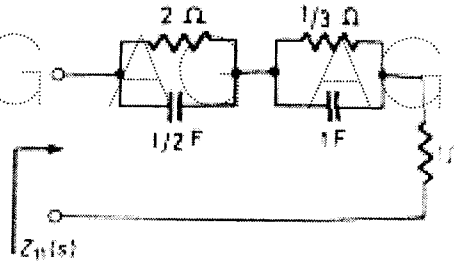


**Figure 10**

**OR**

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

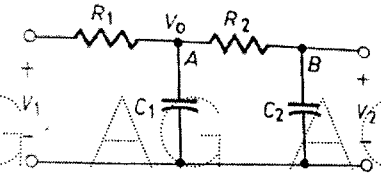


**Figure 11**

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 Ω and shunt arm of 350 Ω. 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 Ω and load impedance of 900 Ω.

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

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