R18

Code No: 153BH

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech II Year I Semester Examinations, December - 2019

NETWORK ANALYSIS AND TRANSMISSION LINES

(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 as sub questions.

Note: Provide a Smith chart.

PART – A

(25 Marks)

1.a) What is graph of a network? Mention different types of graphs. [2]

b) What is time constant? Explain with respect to series RL circuit. [2]

c) Express ABCD for series network shown in figure 1. [2]

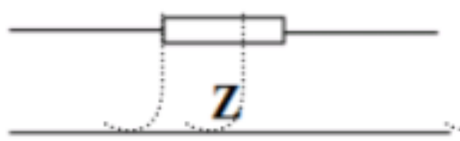

Figure: 1

d) Evaluate the condition on inductor so as to achieve minimum attenuation on a transmission line. [2]

e) How do you realize lumped elements using short circuit transmission lines? [2]

f) Differentiate between planar and non planar graph. [3]

g) A series resonant circuit has a bandwidth of 100 Hz and contains a 20mH inductance and a 2 μF capacitance. Determine f_o, Q. [3]

h) Design a π type attenuator with attenuation = 20dB and characteristic resistance = 600Ω. [3]

i) What is Group velocity? How is it different from phase velocity? [3]

j) Enumerate the differences when smith chart is used as Z chart and Y chart. [3]

PART – B

(50 Marks)

2.a) Define incidence matrix. For the graph shown in figure 2, find the complete incidence matrix.

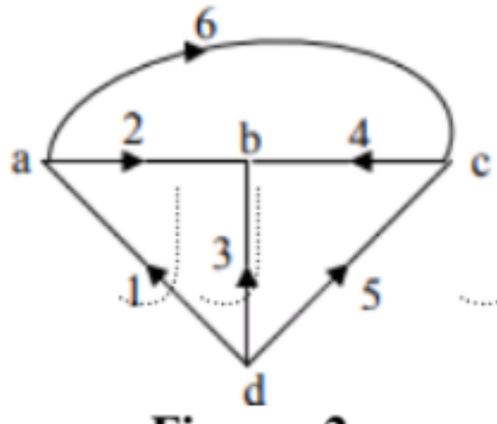

Figure: 2

b) Derive the equation for Equivalent inductance when two inductors are coupled in series opposing and mutual inductance exists between them. [6+4]

OR

3.a) Obtain an expression for coefficient of coupling.

b) Discuss dot convention used in magnetically coupled circuits. [5+5]

4.a) In a parallel Resonant circuit shown in figure 3, find the Resonant frequency, Dynamic impedance, Bandwidth, Q-factor and Current at resonance?

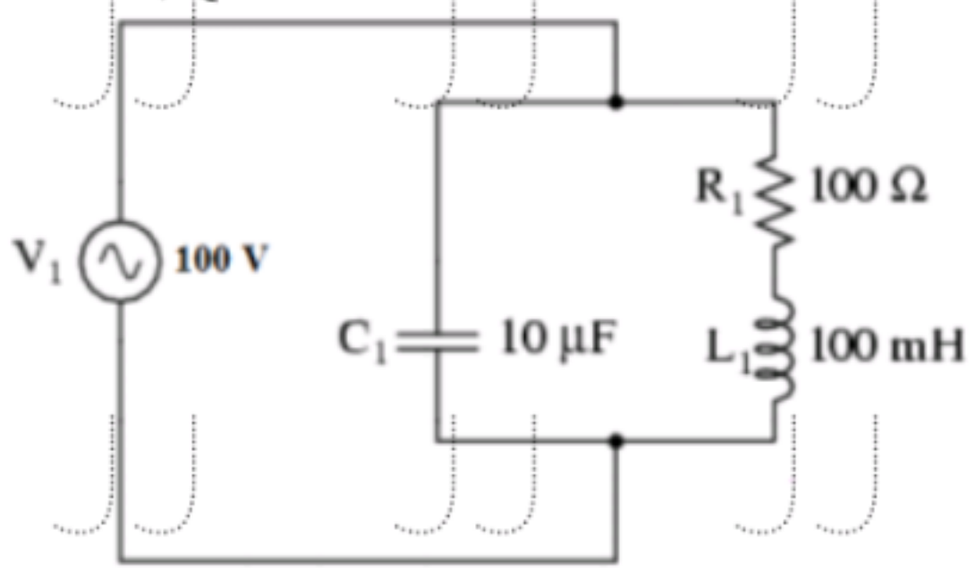

Figure: 3

b) A coil has an inductance of 1.3 mH and resonates at 600 KHz and its Q = 30. If the bandwidth required is 50 kHz what resistor should be connected across the coil? [5+5]

OR

5.a) Derive the expression for bandwidth of series resonating circuit and its relation with Q.

b) An inductance of 0.5H, a resistance of 5Ω and a capacitance of 8µF are in series across a 220V ac supply. Calculate the frequency at which the current flowing through the circuit becomes maximum. Also, find bandwidth, half power frequencies and voltage across capacitance at resonance. [5+5]

6.a) Express Y parameters interms of hybrid parameters.

b) Find Y and Z parameters for the network of figure 4 which contains both dependent current and voltage source. [4+6]

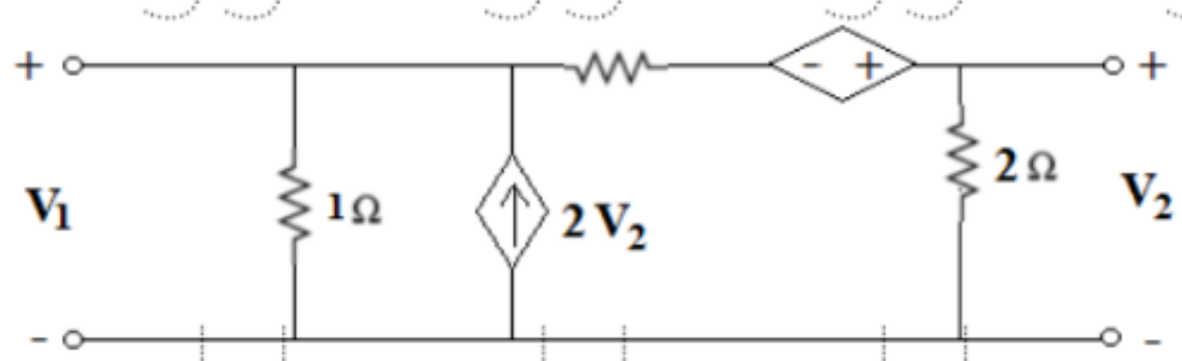

Figure: 4

OR

7.a) Apply the T-π transformation to obtain an equivalent T network for the capacitive network given in the figure 5.

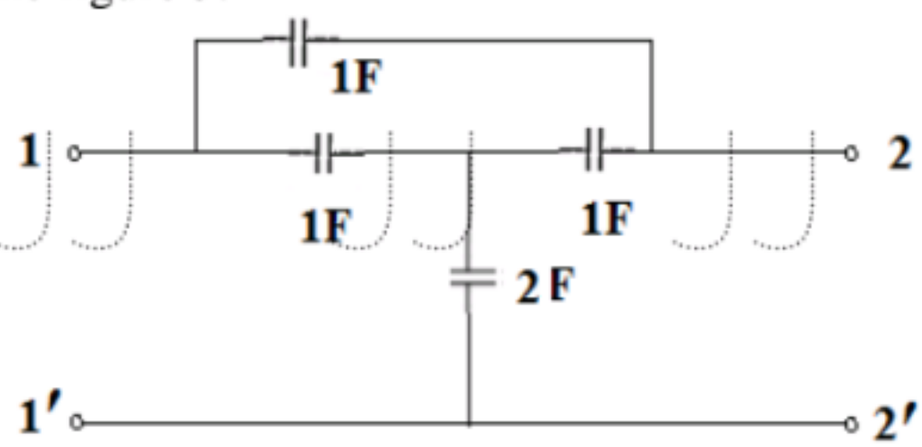

Figure: 5

b) Find the ABCD parameters for the following circuit shown in figure 6. [4+6]

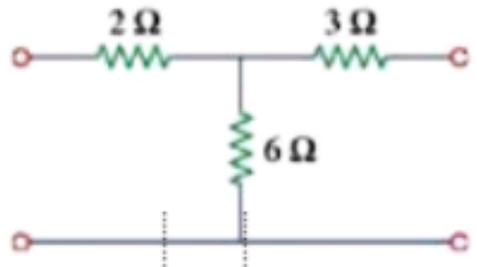

Figure: 6

8.a) Derive the transmission line equations in terms of sending and receiving end voltages and currents.

b) The characteristic impedance of a 805 m long transmission line is 94 $\angle -23.2^0$ Ω, the attenuation constant is 74.5×10^{-6}Np/m and the phase shift constant is 174×10^{-6}rad/m at 5 kHz. Calculate the line parameters R, L, G and C per meter and the phase velocity of the line. [5+5]

OR

9.a) Explain in detail the distortions present on the transmission line. Derive the condition for distortionless line.

b) The characteristic impedance of a low loss transmission line is 90Ω and it is terminated by another impedance of (130-j980) Ω . The wavelength of the line is 2.6m. Determine the (i) VSWR (ii) Minimum and maximum impedance. [5+5]

10.a) Write properties of λ/4, λ/2, λ/8 line and mention applications of each line.

b) A slotted line measurement yields the following parameter values. (i) Voltage minima at 9.2cm and 12.4cm measured away from the load with the line terminated in a short. (ii) VSWR=5.1 with line terminated in the unknown load, a voltage minima is located 11.6cm measured away from the load. Using smith chart calculate normalized load impedance. [4+6]

OR

11.a) What is single stub matching. Mention its types. Derive the expressions for length and location of stub to achieve impedance matching.

b) The 0.1λ length line has characteristic impedance of 50Ω and is terminated with a load impedance of ZL=5+j25Ω (i) locate ZL=0.1+j0.5 on the smith chart. (ii) What is impedance at l=0.1λ. **(use smith chart)** [6+4]

---ooOoo---