

**Code No: 153BH**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech II Year I Semester Examinations, February -2024**

**NETWORK ANALYSIS AND TRANSMISSION LINES**

**(Electronics and Communication Engineering)**

**Time: 3 Hours**

**Max. Marks: 75**

**Note:** i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART – A**

**(25 Marks)**

- 1.a) List the properties of incidence matrix. [2]
- b) A connected graph has 9 branches and 4 branch currents which are independent. Find the number of nodes. [3]
- c) Define the underdamped circuit. [2]
- d) Explain the procedure to draw the root locus diagram of RLC series circuit when R is varying. [3]
- e) What is transfer function? [2]
- f) How to identify the poles and zeros of a transfer function? [3]
- g) Define the propagation constant of a transmission line. [2]
- h) Define characteristic impedance. [3]
- i) Explain how the Voltage Standing Wave Ratio (VSWR) is related to reflection coefficient. [2]
- j) Explain the use of quarter wave line for impedance matching? [3]

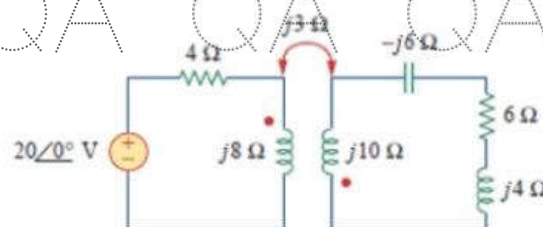
**PART – B**

**(50 Marks)**

- 2.a) Derive an expression for coefficient of coupling between two mutually coupled coils.
- b) What is an Ideal Transform? State its properties. [5+5]

**OR**

- 3.a) Consider two coils with mutual inductance and a magnetic coupling. Apply the dot convention to represent the polarities of the coils. Derive expressions for self-inductance and mutual inductance in terms of magnetic field parameters.
- b) Find the input impedance of the circuit and the current from the voltage shown in the below figure 1 and the current from voltage source. [5+5]



**Figure 1**

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- 4.a) Show that the resonant frequency  $\omega_0$  of an RLC series circuit is the geometric mean of  $\omega_1$  and  $\omega_2$ , the lower and upper half-power frequencies respectively.  
 b) For the circuit shown in figure:2, determine the value of capacitive reactance, impedance and current at resonance. [5+5]

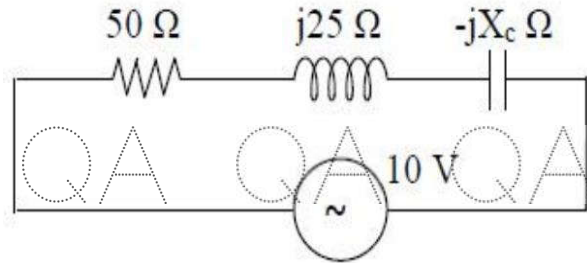


Figure 2  
**OR**

- 5.a) For a series resonant circuit with constant voltage and variable frequency, obtain the Frequency at which voltage across the inductor is maximum. Calculate this maximum voltage when  $R=50$  ohms,  $L=0.05$ H,  $C=20\mu$ F and  $V=100$  volts.  
 b) Find  $C$  which results in resonance in the circuit shown in Figure 3 when  $\omega=5000$ rad/s.

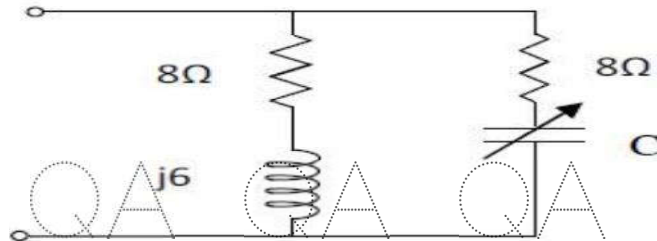


Figure 3

[5+5]

- 6.a) Derive the relationship between Z parameters and h- parameters.  
 b) What are poles and zeros? What is their significance? Draw the pole-zero plot for the following transfer function. [5+5]

$$T(s) = \frac{s^2 + 3s + 2}{s(s^2 + 2s + 2)(s^2 + 4s + 3)}$$

**OR**

- 7.a) Two two-port networks are connected in series. Prove that the overall impedance parameter matrix is the sum of individual impedance parameters matrices.  
 b) State different parameters to be considered for the design of attenuator. [5+5]

- 8.a) Explain about waveform distortion and distortion less line condition?  
 b) Derive the equation of attenuation constant and phase constant of TL in terms of R,L, C, G. [4+6]

**OR**

9. Discuss in detail about inductance loading of telephone cables and derive the attenuation constant and phase constant and velocity of signal transmission ( $v$ ) for the uniformly loaded cable? [10]

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10. Design a single stub match for a load of  $(150 + j225)\Omega$  for a  $75 \Omega$  line at  $500 \text{ MHz}$  using smith chart. [10]

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11. Derive the expression for the input impedance of the dissipation less line. [10]

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