

Code No: **R231211**

**R23**

**SET - 1**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM**  
**I B. Tech II Semester Supplementary Examinations January-2025**  
**NETWORK ANALYSIS**

(Only ECE)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part A & Part B.*  
*Part A is compulsory, Answer all questions.*  
*In Part B, Answer any one question from each unit.*  
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**PART-A**

**(20 Marks)**

- 1 a) What is the difference between independent and dependent sources. [2]
- b) State Thevenin's theorem with equivalent circuit. [2]
- c) Write the expression for the time constant of an R-L circuit with DC excitation with graph. [2]
- d) State the initial value theorem in Laplace transforms. [2]
- e) Show the phasor representation of current and voltage in R,L,C circuit? [2]
- f) Write the expression for impedance in a series R-C & R-L circuits? [2]
- g) Differentiate between series resonance and parallel resonance? [2]
- h) Discuss the coefficient of coupling affect the behavior of coupled circuits. [2]
- i) List the types of attenuators commonly used in electrical circuits? [2]
- j) State the relationship between Z and Y parameters. [2]

**PART-B**

**(50 Marks)**

**Unit-1**

- 2 a) Solve the mesh and branch currents shown in figure.1 [5]

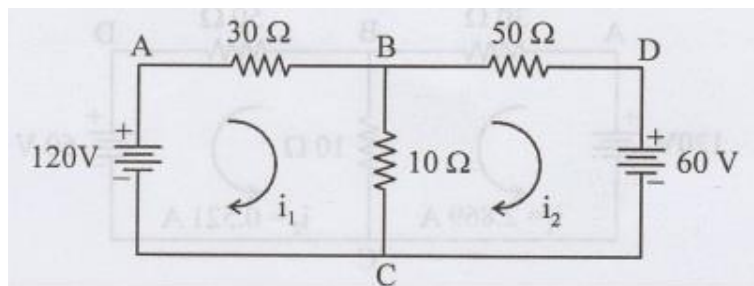


Figure: 1

- b) Explain with an example of a pair of dual elements in electrical circuits. [5]

(OR)

- 3 a) Find the current through  $3\ \Omega$  resistor using superposition theorem as shown in figure.2 [5]

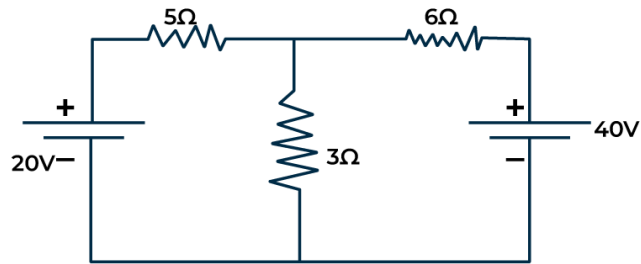


Figure:2

- b) Explain Millman's theorem in brief using an example. [5]

### Unit-2

- 4 a) Derive the expression for the transient response of an R-L circuit with DC excitation? [5]
- b) Find the inverse Laplace transform for the Laplace transform [5]
- $$F(s) = (s+3) / (s^2+4s+3).$$

(OR)

- 5 a) Derive the expression for the transient response of an R-C circuit with DC excitation? [5]
- b) Explain Heaviside's expansion theorem with an example. [5]

### Unit-3

- 6 a) A resistance and a coil are connected in series and supplied from a single phase, 100 V, 50 Hz ac source as shown in the figure.3. Determine the rms values of voltages across the resistance ( $V_R$ ) and coil ( $V_C$ ) respectively, in volts. [5]

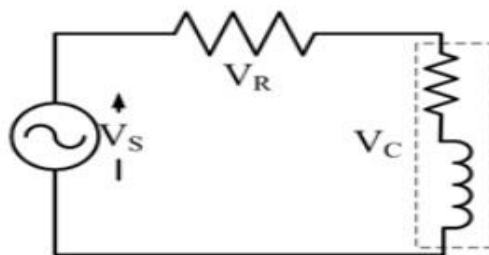


Figure: 3

- b) Find the RMS value of the voltage  $u(t) = 3 + 4 \cos(3t)$ ? [5]

(OR)

- 7 a) Calculate the current  $I_C$  in the figure.4 for an RLC circuit with relevant data. [5]

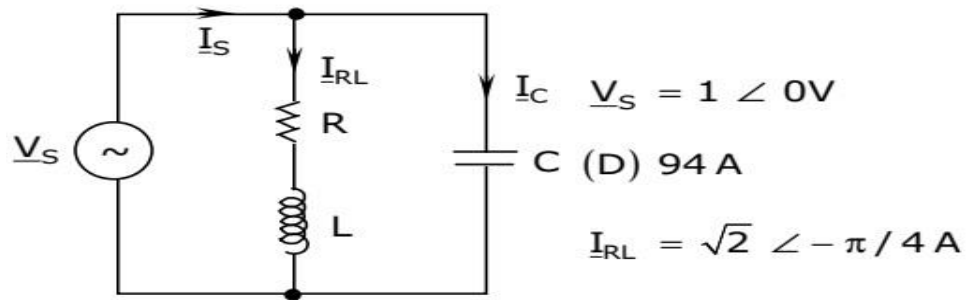


Figure:4

- b) Determine the average power delivered to an impedance  $(4-j3)\Omega$  by a current  $5\cos(100\pi t+100^\circ)\text{A}$  [5]

#### Unit-4

- 8 a) Calculate  $L_1$ ,  $L_2$ ,  $M$  and coupling coefficient for two coils when connected in series-aiding fashion have a total inductance of 250 mH. When connected in a series-opposing configuration, the coils have a total inductance of 150mH. If the inductance of one coil ( $L_1$ ) is three times the other. [5]

- b) Derive the expression for impedance in a parallel resonant circuit and discuss its behavior at resonance. [5]

(OR)

- 9 a) Derive the expression for resonant frequency in a series R-L-C circuit and explain its significance. [5]

- b) Determine the inductance of the three series-connected inductors of Figure.5 [5]

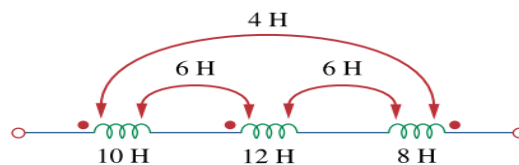


Figure:5

#### Unit-5

- 10 a) Derive the condition for reciprocity and symmetry in h-parameters. [5]

- b) Explain the concept of image impedance with an example. [5]

(OR)

- 11 a) Explain the lattice network and derive its parameters. [5]

- b) Explain the relationship between h-parameters and ABCD parameters. [5]