

Code No: 123BW

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B.Tech II Year I Semester Examinations, March - 2017

ELECTRICAL CIRCUITS

(Common to EEE, ECE, ETM)

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) State Ohm's law and mention its limitations. [2]
- b) Explain how voltage source with a source resistance can be converted into an equivalent current source. [3]
- c) Mention the disadvantages of low power factor. [2]
- d) In a series R-C circuit, $R=10\Omega$ and $C=25\text{nF}$. A sinusoidal voltage of 50 mHz is applied and the maximum voltage across the capacitance is 2.5 V. Find the maximum voltage across the series combination. [3]
- e) Define mutual inductance and self inductance. [2]
- f) Find the total inductance of the three series connected coupled coils shown in the figure 1. [3]

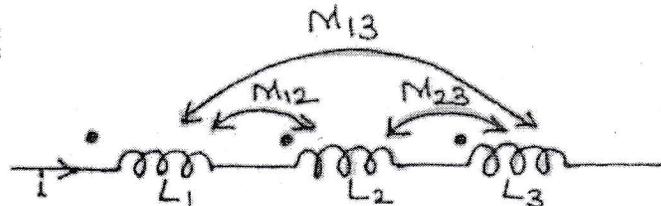


Figure: 1

- g) Mention the properties of a tree in a graph. [2]
- h) Explain graphical method to draw dual network. [3]
- i) State superposition theorem and Reciprocity theorem. [2]
- j) Give the proof of Tellegen's theorem. [3]

PART-B

(50 Marks)

- 2.a) State Kirchoff's voltage and current laws.
- b) Find 'i' in the circuit given in figure 2. Check the power balance condition. [3+7]

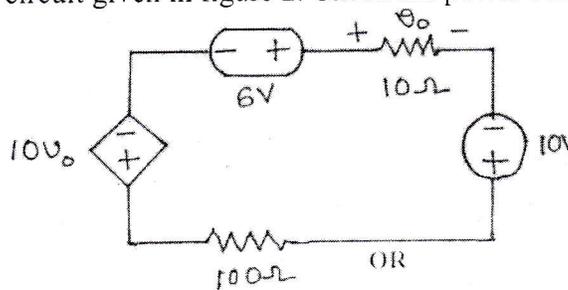


Figure: 2

OR

- 3.a) Determine the node voltages and the current through the resistors using mesh method for the network given in figure 3.

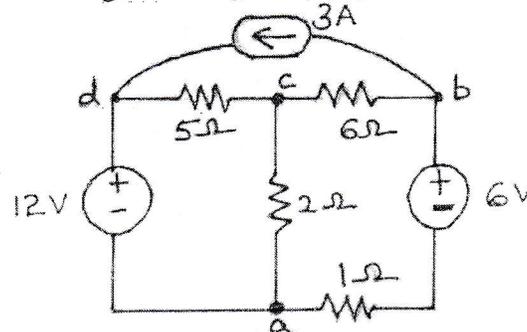


Figure: 3

- b) Mention the difference between nodal analysis and mesh analysis. [7+3]

- 4.a) A series R-L circuit, has resistance of 20Ω and inductance of 0.02H . If the net impedance of the given circuit is $40\angle\Phi^\circ\Omega$, find Φ and the frequency of the circuit.

- b) Define RMS value, Average value and Form factor. [4+6]

OR

5. A voltage $v(t) = 200\sin\omega t$ is applied to a series RLC circuit where $R=60\Omega$, $L=0.18\text{mH}$ and $C=20\mu\text{F}$. Find:

- The power supplied by the source
- The reactive power supplied by the source
- The reactive power of the capacitor
- The reactive power of the inductor and
- The power factor of the circuit.

[10]

6. Derive the equation for quality factor of series resonating circuit and parallel resonating circuit. [10]

OR

- 7.a) Define quality factor and Bandwidth.

- b) In the coupled circuit given in figure 4, find the input impedance as well as the net inductance when $L_1=0.2\text{H}$, $L_2=0.5\text{H}$ coefficient of coupling (K) being 0.5. [5+5]

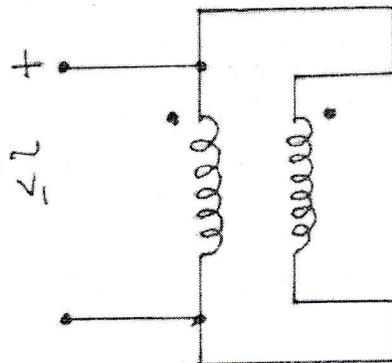


Figure: 4

- 8.a) Explain the concept of duality.

- b) Define a fundamental Tie set and Cut set matrix. Give the procedure for obtaining the same with suitable examples. [3+7]

OR

9.a) The figure 5 represents a graph of a network. Show the tree, twigs and links.

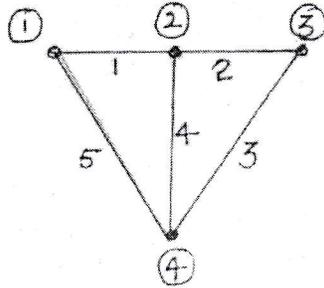


Figure: 5

b) Convert the given current source to voltage source shown in figure 6. [5+5]

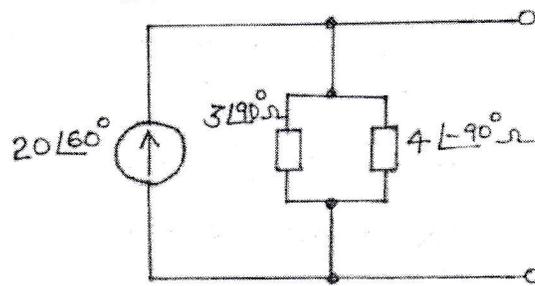


Figure: 6

10.a) State and explain Thevenin's and Norton's theorems.

b) Using Millman's theorem find the current through R_L and voltage drop in the circuit given in figure 7. [5+5]

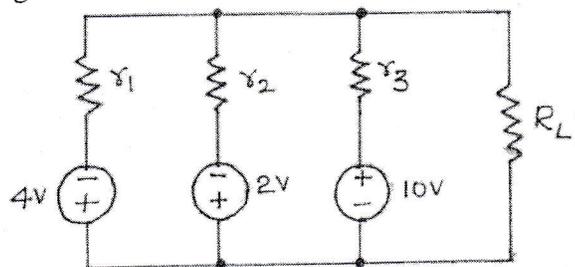


Figure: 7

OR

11.a) State and explain Maximum power transfer theorem and compensation theorem.
b) Find the Norton's equivalent circuit across a-b for the network shown in figure 8. [5+5]

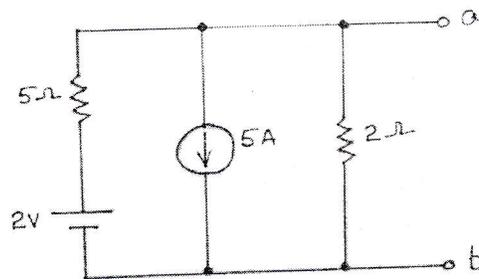


Figure: 8