

**R15**

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.

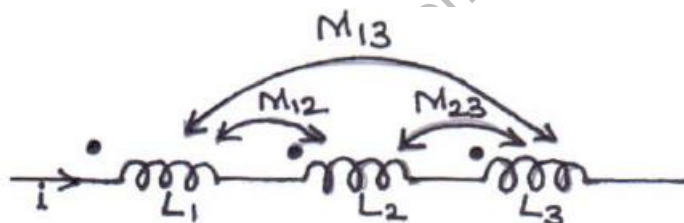
Part B consists of 5 Units. Answer any one full question from each unit.

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]



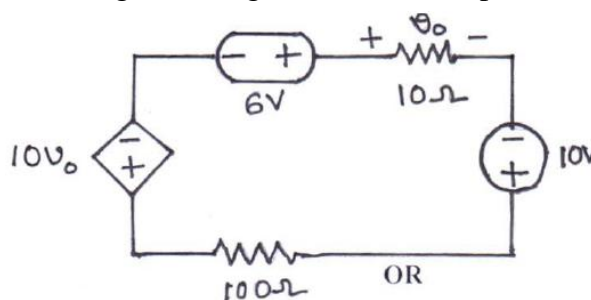
**Figure: 1**

- 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)**

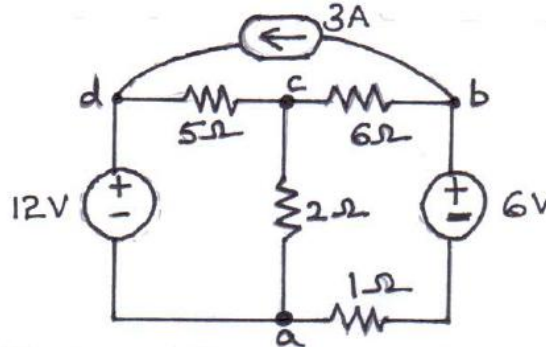
- 2.a) State Kirchoff's voltage and current laws.
- b) Find 'i' in the circuit given in figure 2. Check the power balance condition.[3+7]



**Figure: 2**

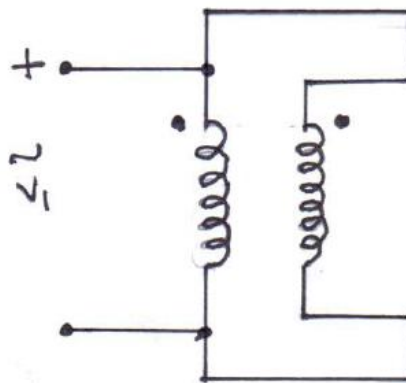
**OR**

- 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  $20\Omega$  and inductance of  $0.02H$ . If the net impedance of the given circuit is  $40\angle\Phi^\circ\Omega$ , find  $\Phi$  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  $R=60\Omega$ ,  $L=0.18mH$  and  $C=20\mu F$ . 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  $L_1=0.2H$ ,  $L_2=0.5H$  coefficient of coupling (K) being 0.5. [5+5]

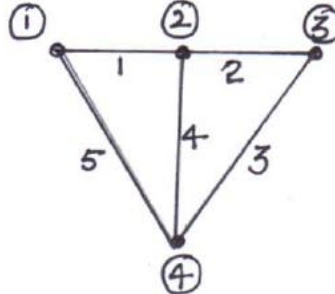


**Figure: 4**

- 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]

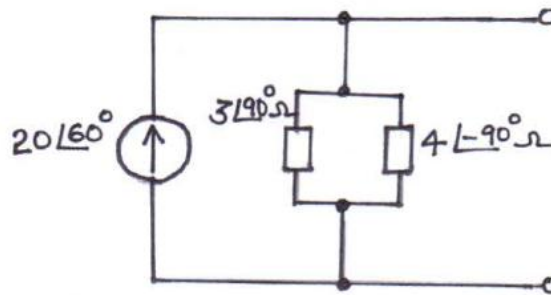
**OR**

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



**Figure: 5**

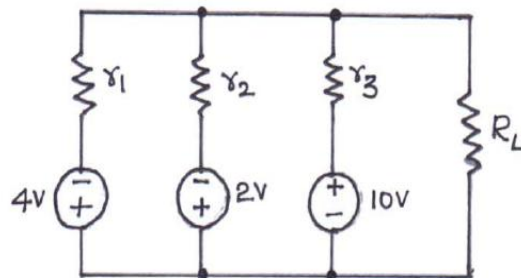
- b) Convert the given current source to voltage source shown in figure 6. [5+5]



**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]

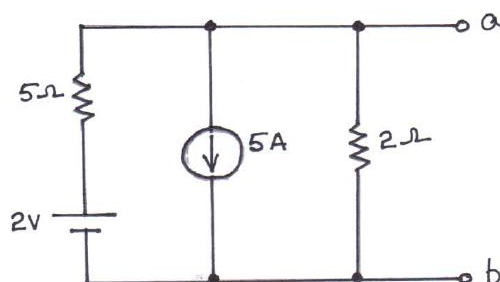


**Figure: 7**

**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**