Code No: 123BW

R15

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=10Ω and C=25nF. 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]

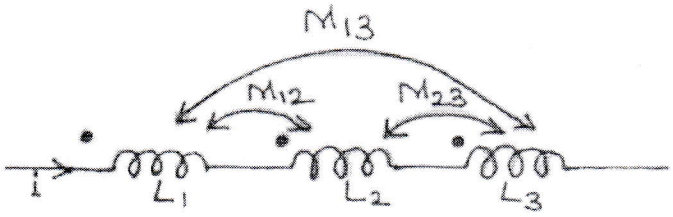

Figure: 1

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]

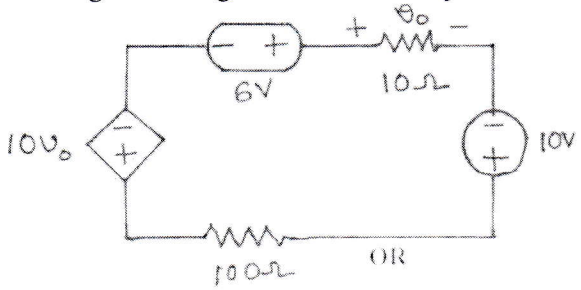

Figure: 2

OR

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

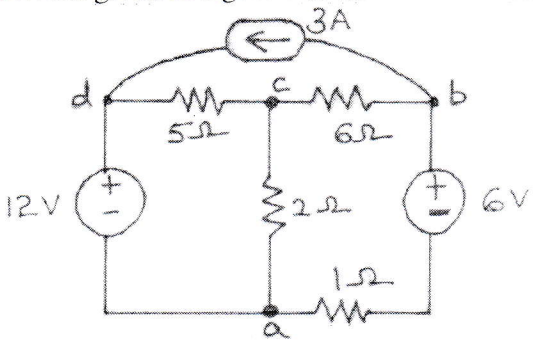

Figure: 3

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 $40\angle\Phi^0\Omega$, 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=60Ω, L=0.18mH and C=20μF. Find:
a) The power supplied by the source
b) The reactive power supplied by the source
c) The reactive power of the capacitor
d) The reactive power of the inductor and
e) 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]

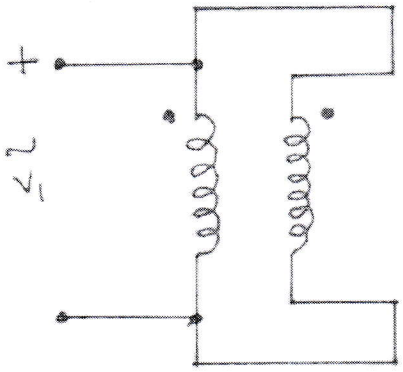

Figure: 4

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.

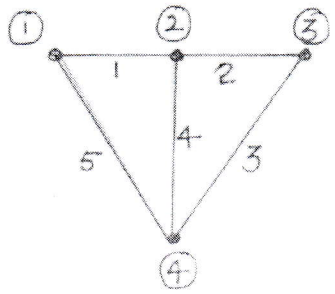

Figure: 5

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

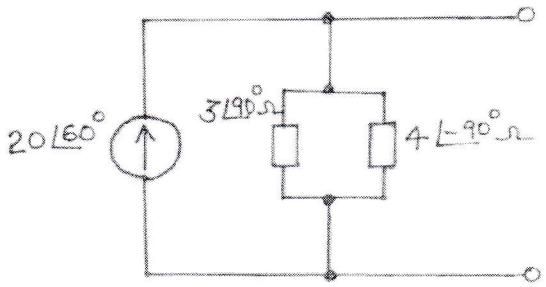

Figure: 6

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

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

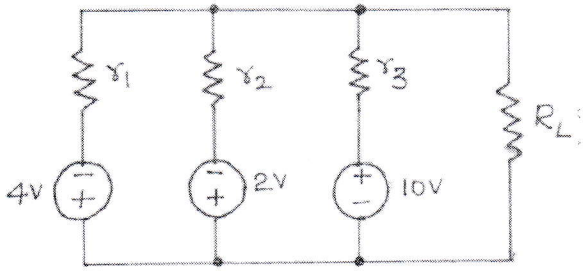

Figure: 7

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]

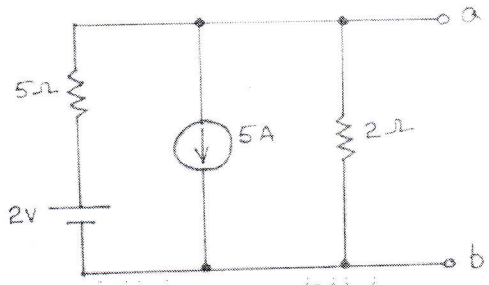

Figure: 8

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