Code No: 113BW **R13**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year I Semester Examinations, February/March - 2016
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 KVL and underlying logic. [2]
b) Distinguish between dependent and independent sources. [3]
c) What is meant by locus diagram? [2]
d) Find the power delivered from a sinusoidal source to a resistor *R*. [3]
e) Write the expression for equivalent inductance of series connected magnetically coupled coils. [2]
f) What is the significance of power factor? [3]
g) Give the properties of tree in a graph. [2]
h) Write some applications of maximum power transfer theorem. [3]
i) Define super node. Indicate the super node in a network. [2]
j) State Milliman's theorems for D.C excitation. [3]

PART- B (50 Marks)

2.a) Distinguish between star (3 and 4-wire) and delta connections.
b) What values must R_1 and R_2 have when $I_1 = 4A$ and $I_2 = 6$ A both charging in the circuit of Figure 1.

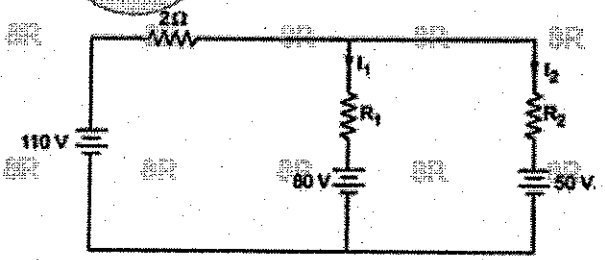

Figure 1

c) An electric heater consumes 1.8MJ when connected to a 250V supply for 30 minutes. Find the power rating of the heater and the current taken from the supply. [2+4+4]

OR

3.a) If a unit step voltage is given to an inductor of 1H, then what is the current flowing through it?

b) Find the current flowing in the 3 Ω resistor for the network shown in Figure 2. Find also the potential difference across the 10 Ω and 20 Ω resistors.

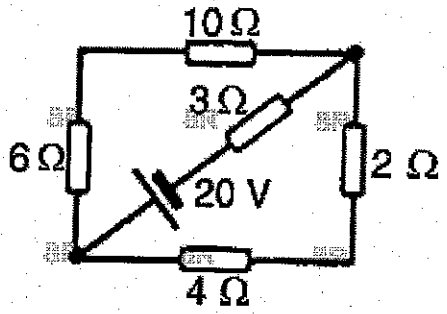

Figure 2

c) What are active and passive elements? Give examples of each. [2+5+3]

4.a) Find the ac power entering an inductor *L*.

b) A two-element series circuit has average power 940W and power factor 0.707 leading. Determine the circuit elements if the applied voltage is $v = 99.0 \cos(6000t+30^o)$ V.

c) Write the expression for the impedance of the RC circuit in rectangular and polar form. [2+4+4]

OR

5.a) Find the total instantaneous power $p(t)$, the average power P, and the reactive power Q, delivered from $v = (V\sqrt{2})\cos\omega t$ to a parallel RLC combination.

b) Find the two elements of a series circuit having current $i = 4.24 \cos(5000t + 45^o)A$, power 180W, and power factor 0.80 lagging.

c) Write the expression for the impedance of the RL circuit in rectangular and polar form. [4+4+2]

6.a) Write the characteristics of series resonance.

b) An average e.m.f of 60V is induced in a coil of inductance 160mH when a current of 7.5A is reversed. Calculate the time taken for the current to reverse.

c) For a series RL circuit obtain the locus of current as inductance is changed from 0 to ∞ when the applied voltage is constant. [3+4+3]

OR

7.a) For the circuit in Figure 3, find the value of ω so that current and source emf are in phase. Also find the current at this frequency.

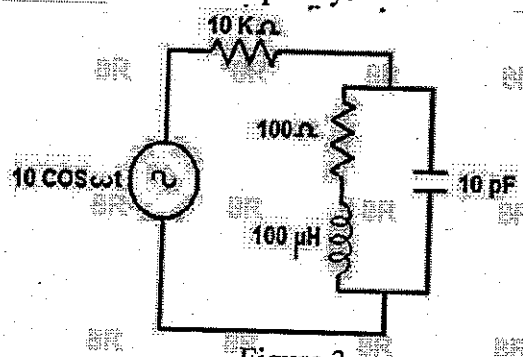

Figure 3

b) Derive the formula for mutual inductance in terms of coefficient of coupling and self-inductance.

c) State dot rule for coupled circuit. [4+3+3]

8.a) What is a dual network? Give examples.

b) For the topological graph shown in Figure 4, obtain the fundamental tie-set matrix choosing the tree containing two elements 5 and 6.

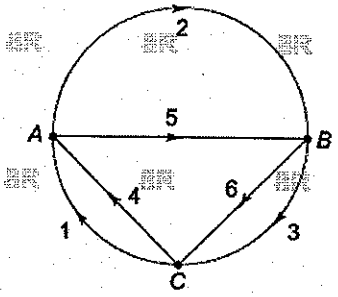

Figure 4

c) Define and explain the Oriented Graph with an example. [4+3+3]

OR

9.a) For the network shown in Figure 5, draw the graph and tree.

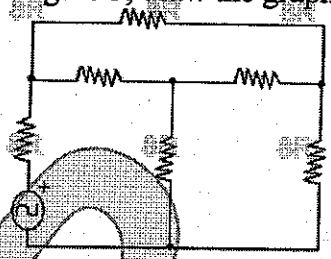

Figure 5

b) Describe the procedure to construct the dual of a network with an example.

c) Explain the sub-graph with respect to graph theory. [3+4+3]

10.a) State the steps to solve the Norton's theorem.

b) Find the value of R_L so that maximum power is delivered to the load resistance shown in Figure 6.

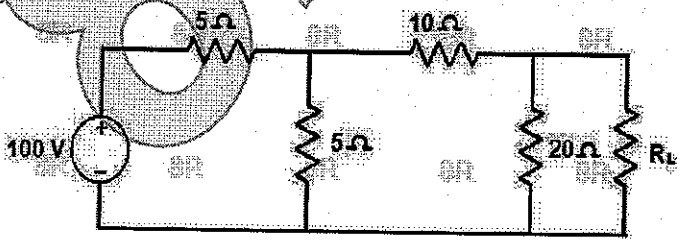

Figure 6

c) State Tellegen's theorem. [3+3+4]

OR

11.a) State reciprocity theorem.

b) Find the value of the adjustable resistance R which results in maximum power transfer across the terminals *ab* of the circuit shown in Figure 7.

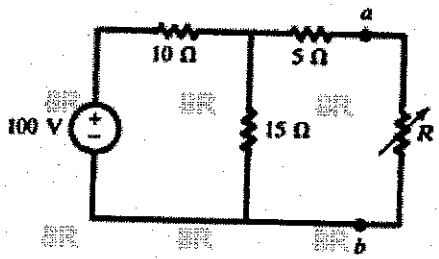

Figure 7

c) What is the limitation of superposition theorem? [3+3+4]

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