R09

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY, HYDERABAD
B.Tech II Year I Semester Examinations, December-2014
ELECTRIC CIRCUITS
(Common to ECE, ETM)

Time: 3 hours

Max. Marks: 75

Answer any five questions
All questions carry equal marks

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1.a) Find the energy stored in an inductor of value 5 mH, if the current in it varies from 1 A to 5 A in 10 sec

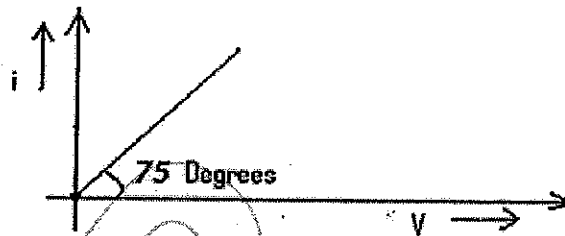 b) Find the value of resistor whose V-I Characteristics is given in the Figure 1 below

Figure 1

  c) Given the expression of charge in a capacitor $Q(V) = 3V^3 + 2V^2 + V$. Determine the value of the capacitance at $V = 2$ Volt.

  d) A practical current source when open circuited produces 100 V and when short circuited the current in short circuit is 10 A. Find the voltage across a load of 10 Ω connected to the source

  e) Given the current passing through an element as $i(t) = 2e^{-5t}$ A.
  Determine the total charge passed through the element when t = 4 sec.

2.a) What does mean by super mesh and super node? Explain with examples.
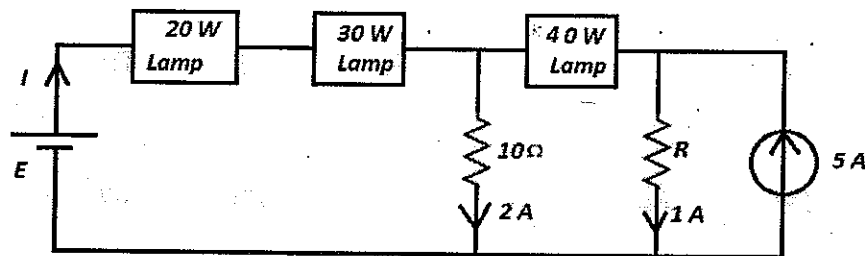
  b) For the circuit shown in Figure 2 below.

Figure 2

Find E, I, R and the voltage across 30 W Lamp.

3.a) For the periodic waveform given in Figure 3 below, find the RMS value

Figure 3

b) A coil of 10 mH having a series resistance of 10 Ω is connected in parallel with a capacitor C and the combination is fed from 100 V, 1 kHz supply having an internal resistance of 5 Ω, if the circuit draws the power at 0.9 lagging power factor, determine the value of capacitor and power drawn by the circuit.

4.a) Draw the locus diagram of a series RLC circuit and explain briefly the procedure of drawing it.

b) A parallel RLC resonant circuit with quality factor 100 has a resonant frequency of 5×10^6 rad/sec. Calculate the Bandwidth and half power frequencies.

5.a) For the circuit shown in the Figure 4 below, determine $\dfrac{di_1}{dt}$ and $\dfrac{di_2}{dt}$.

Given $v_1 = 2e^{-3t} V$, $v_2 = 5e^{-2t} V$, $L_1 = L_2 = 5H$ and $M = 0.5H$.

Figure 4

b) The circuit shown in Figure 5 below, shows a schematic representation of a synchronous machine. The length of air gap between the rotor and stator is 1 cm each and the rotor pole face area is 2000 cm². The winding on rotor has 2000 turns and carries a current of 10 A. If both rotor and stator are assumed to have negligible reluctance and there is no fringing. Draw the equivalent magnetic circuit and calculate

(i) MMF   (ii) Reluctance of each air gap
(iii) Magnetic flux and   (iv) Magnetic flux density in each air gap.

Figure 5

6.a) Define Cutset and Tieset and find the cutest and tieset matrices by taking a suitable example

b) Draw the graph of the following network shown in Figure 6 and from the graph find the loop currents using loop method of analysis
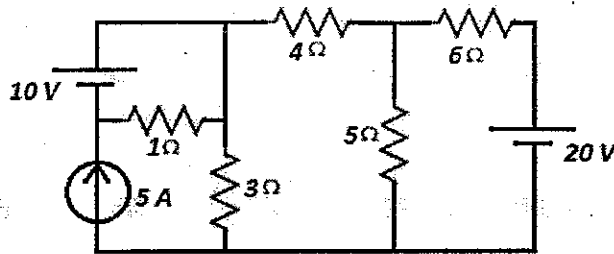

Figure 6

7.a) State and explain Maximum power transfer theorem with suitable example and derive the condition for maximum power transfer to the Resistive load.

b) For the circuit diagram shown in Figure 7 below, can super position theorem be applied? Find the current in 1 Ω resistor.

Figure 7

8.a) For AC circuits, state and explain Millman's theorem by taking a suitable example.

b) By taking a suitable AC circuit, explain the procedure to find Norton's current and Norton's resistance.

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