CBCS Scheme

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15EE32

Third Semester B.E. Degree Examination, Dec.2017/Jan.2018
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

1 a. Distinguish between :i) active and passive elements ii) ideal and practical sources. **(04 Marks)**

b. Determine the currents i_1, i_2 and i_3 in the circuit of Fig.Q1(b), using Mesh current method. **(06 Marks)**

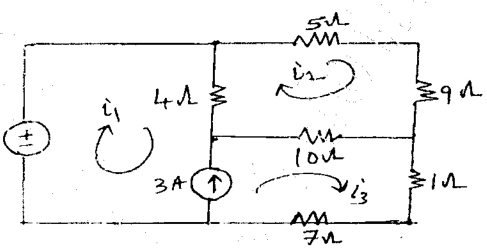

Fig.Q1(b)

c. Find the node voltages for the circuit of Fig.Q1(c) using nodal analysis. **(06 Marks)**

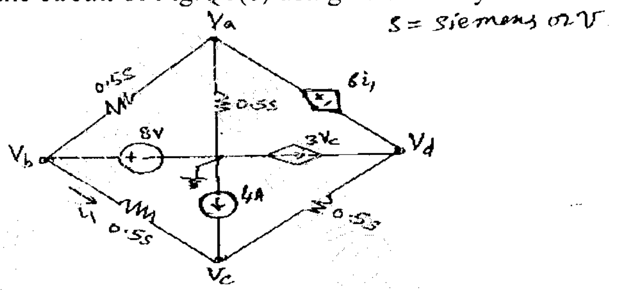

Fig.Q1(c)

OR

2 a. Find the equivalent resistance across a – b, of the circuit, of Fig.Q2(a) using delta –star conversion. **(04 Marks)**

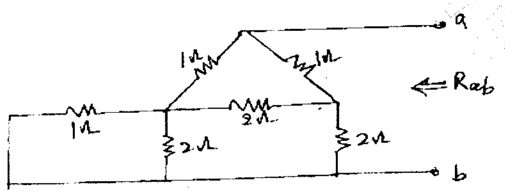

Fig.Q2(a)

b. A series resonance circuit has R = 10Ω, L = 5mH, and C = 20μF. Find the following : i) Resonant frequency ii) Q – factor and iii) Current at resonance condition, if the applied voltage is 100V. Hence derive the expressions for the same. **(08 Marks)**

c. Draw the dual of the network shown in Fig.Q2(c). **(04 Marks)**

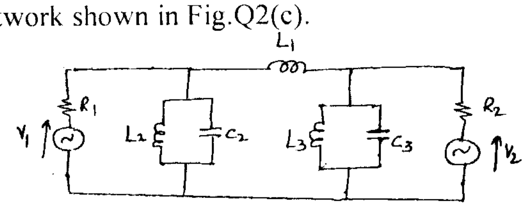

Fig.Q2(c)

Module-2

3 a. State and explain maximum power transfer theorem for DC circuit [resistive load]. **(06 Marks)**

b. Find the Thevenin's and Norton's equivalent circuit for the network shown in Fig.Q3(b), as seen from the terminals a – b. **(10 Marks)**

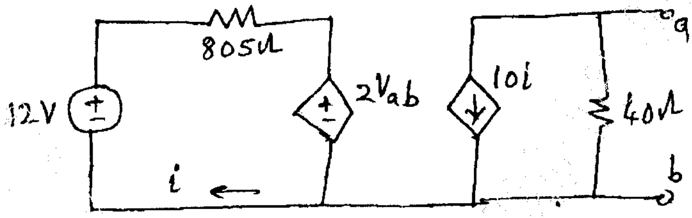

Fig.Q3(b)

OR

4 a. State and prove reciprocity theorem. **(06 Marks)**

b. Using super position theorem, find the current I in the network shown in Fig.Q4(b). **(10 Marks)**

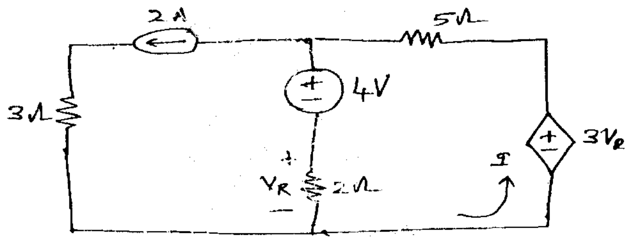

Fig.Q4(b)

Module-3

5 a. What are initial conditions and their use in network analysis? **(04 Marks)**

b. For the network elements R, L and C, write the equivalent circuits :

i) At $t = 0^+$ [initial condition]

ii) At $t = \infty$ [Final condition]. **(06 Marks)**

c. In the network shown in Fig.Q5(c), the switch K is closed at t = 0 with the capacitor uncharged. Find the values for i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. **(06 Marks)**

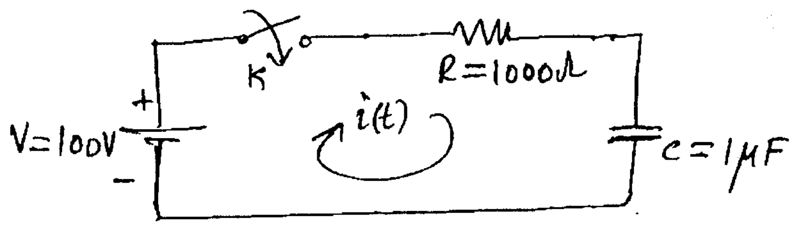

Fig.5Q(c)

OR

6 a. In the network of Fig.Q6(a), the switch K is changed from position a to b at $t = 0$. Solve for $i, \frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. Assume steady state condition for K in position 'a'. **(08 Marks)**

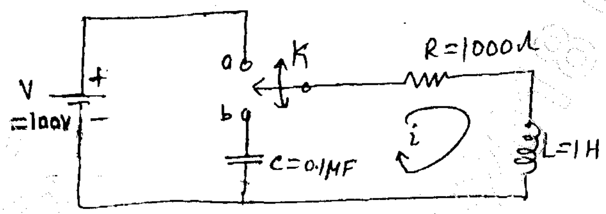

Fig.Q6(a)

b. The network shown in Fig.Q6(b), has the switch k opened at $t = 0$. Solve for $V, \frac{dV}{dt}$ and $\frac{d^2V}{dt^2}$ at $t = 0^+$. **(08 Marks)**

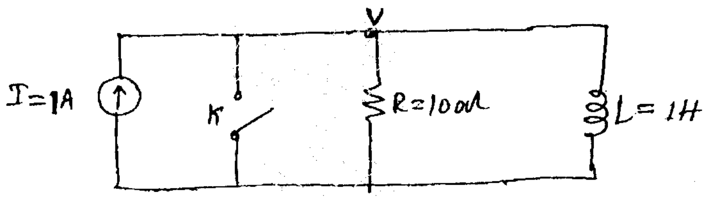

Fig.Q6(b)

Module-4

7 a. Obtain the Laplace transform of :
   i) Ramp function $t\,u(t)$
   ii) Exponential function $e^{-at}u(t)$
   iii) Sinusoidal function $\sin\omega t\; u(t)$. **(06 Marks)**

b. Find the Laplace transform of
   i) $V(t) = 4s(t-2) - 3t\,u(t)$
   ii) $V(t) = u(t)\,u(t-2)$. **(04 Marks)**

c. In a series RLC circuit, the capacitor is initially charged to voltage $V_0 = 1V$, with the switch K open. Find the circuit i(t) if the switch K is closed at $t = 0$, using Laplace transform method. Refer Fig.Q7(c). **(06 Marks)**

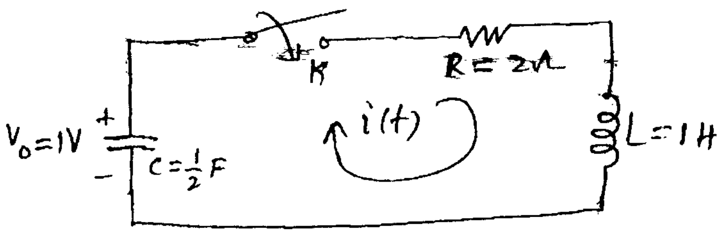

Fig.Q7(c)

OR

8 a. State and prove final value theorem. **(06 Marks)**

b. Determine the initial value f(0) and final value f(∞) for the function given by :

$$f(s) = \frac{5s^2 + 10}{2s[s^2 + 3s + 5]} \;.$$ **(04 Marks)**

c. Find the Laplace transforms of the following waveforms (Refer Fig.Q8(c)). **(06 Marks)**

i) ii)

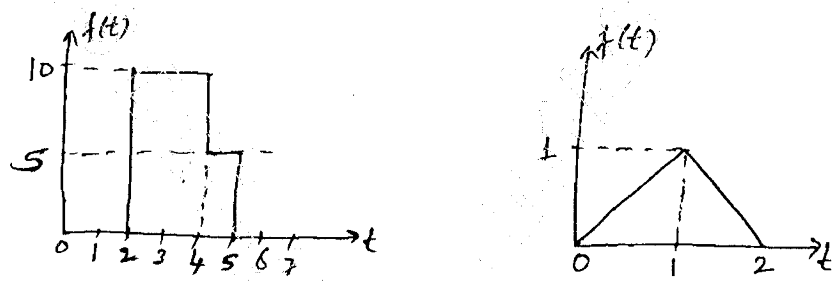

Fig.Q8(c)

Module-5

9 a. Define y-parameters and T-parameters of a two – port network. Write the conditions for symmetry and reciprocity. **(04 Marks)**

b. Obtain y-parameters in terms of T-parameters. **(06 Marks)**

c. Find y-parameters for the network shown in Fig.Q9(c). **(06 Marks)**

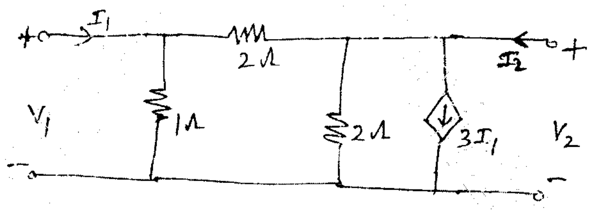

Fig.Q9(c)

OR

10 a. Find an expression for driving point impedance z(s) of the R-C ladder network shown in Fig.Q10(a). Also draw the pole-zero diagram. **(08 Marks)**

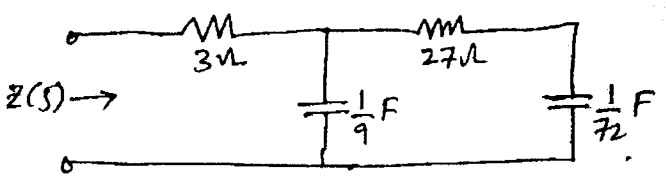

Fig.Q10(a)

b. Find the effective voltage, effective current and the average power supplied to a passive network if the applied voltage, V = 200 + 100 cos [500t + 30°] + 75 cos [1500t + 60°], volts and the resulting current is, i = 3.53 cos [500t + 75°] + 3.55 cos[1500t + 78.45°], Amps. **(08 Marks)**

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