USN ☐☐☐☐☐☐☐☐☐☐

17EE32

Third Semester B.E. Degree Examination, Dec.2018/Jan.2019
Electric Circuit Analysis

Time: 3 hrs.

Max. Marks: 100

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

Module-1

1 a. Find an equivalent resistance between A and B for the network given in Fig. Q1 (a) using star-delta transformation. **(06 Marks)**

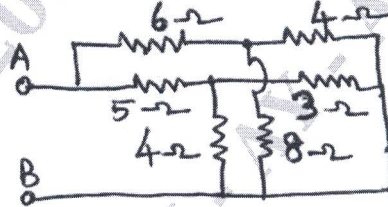
Fig. Q1 (a)

b. Find the currents i_1, i_2 and i_3 in the network given in Fig.Q1 (b) using mesh analysis. **(06 Marks)**
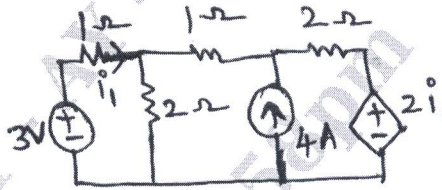

Fig. Q1 (b)

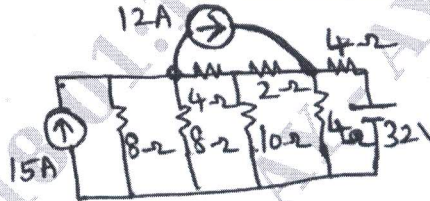c. Find the power dissipated in 10 Ω resistor by nodal analysis in Fig. Q1 (c). **(08 Marks)**

Fig. Q1 (c)

OR

2 a. Distinguish between (i) Active and Passive elements (ii) Ideal and practical sources. **(04 Marks)**

b. Find the node voltage V_1, V_2 and V_3 in the circuit diagram shown in Fig. Q2 (b) using nodal analysis. **(08 Marks)**
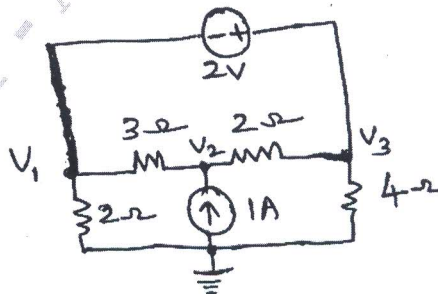

Fig. Q2 (b)

c. Find the current i_a in the circuit given in Fig. Q2 (c) using mesh analysis. **(08 Marks)**
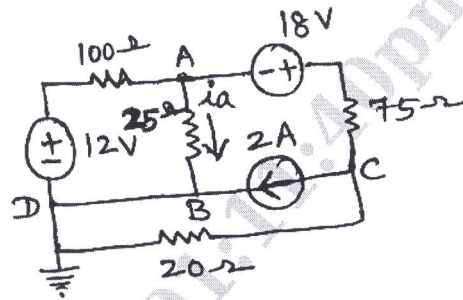

Fig. Q2 (c)

Module-2

3 a. State and explain super position theorem. **(06 Marks)**

b. Find the Thevenin's voltage, short circuit current and determine the actual current flowing through the 6 Ω resistor in the network given in Fig. Q3 (b). **(07 Marks)**
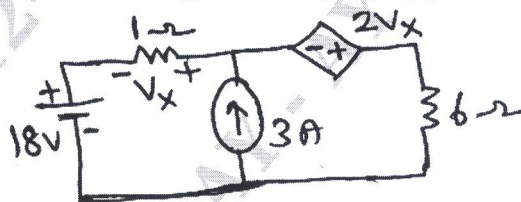

Fig. Q3 (b)

c. Find the current through 16 Ω resistor in the network given in Fig. Q3 (c) using Norton's theorem. **(07 Marks)**
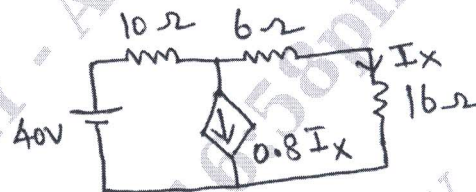

Fig. Q3 (c)

OR

4 a. Verify the reciprocity theorem for the voltage V and current I in the network given in Fig. Q4 (a). **(08 Marks)**
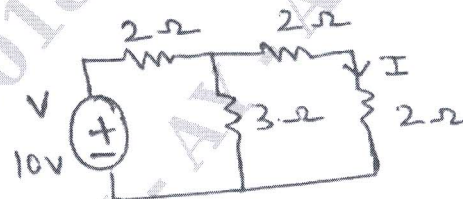

Fig. Q4 (a)

b. Find the value of load resistance R_L when maximum power is transferred across it in the network shown in Fig. Q4 (b). **(04 Marks)**
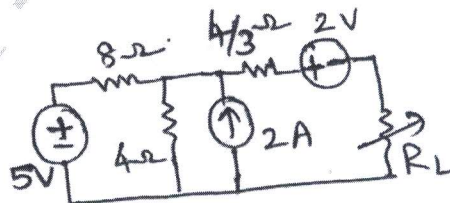

Fig. Q4 (b)

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c. Find the current through R_L using Thevenin's theorem for the network in the Fig. Q4 (c).
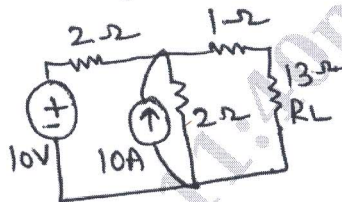
(08 Marks)

Fig. Q4 (c)

Module-3

5 a. Derive expression for resonant frequency in series RLC circuit. (06 Marks)

   b. A series RLC circuit has R = 4 Ω, L = 1 mH and C = 10 μF. Calculate Q factor, bandwidth, resonant frequency and half power frequencies. (08 Marks)

   c. Find the equation of current if the switch is closed at t = 0. Find also the voltage across L and R, the current at t = 0.1 sec and the time at which the voltage across L and R are equal in the Fig. Q5 (c). (06 Marks)

Fig. Q5 (c)

OR

6 a. Find I_o, I_C, I_L, Q factor, resonant frequency and parallel resonance for the parallel resonant circuit shown in Fig. Q6 (a). (08 Marks)
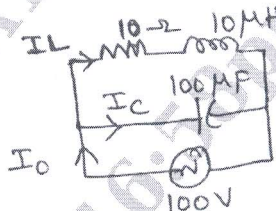

Fig. Q6 (a)

   b. In the Fig. Q6 (b), the switch S is closed at t = 0, find the time when the current from the battery reaches to 500 mA. (08 Marks)
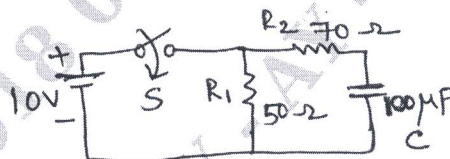

Fig. Q6 (b)

   c. What are the initial conditions and their use in network analysis? (04 Marks)

Module-4

7 a. State and prove initial value theorem and final value theorem. (08 Marks)

   b. Find the Laplace transform of the, (i) $f(t) = 5 + 4e^{-2t}$ (ii) $e^{-at} \sin \omega t$ (04 Marks)

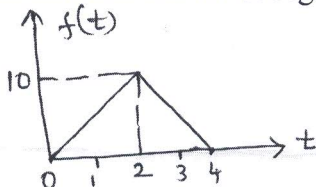   c. Obtain the Laplace transform of the function shown in Fig.Q 7(c). (08 Marks)

Fig. Q7 (c)

OR

8 a. Find the inverse Laplace transform,

   (i) $\dfrac{s^2+5}{s(s^2+4s+4)}$ (ii) $\dfrac{2s+6}{s^2+6s+25}$ **(06 Marks)**

   b. Obtain Laplace transform of,
   - (i) $f(t)=5(t-2)u(t-1)$
   - (ii) $f(t)=4e^{-3t}[u(t+2)-u(t-2)]$
   - (iii) $\delta(t)$
   - (iv) $u(t)$ **(08 Marks)**

   c. Sketch the waveforms,
   - (i) $tu(t-T)$ (ii) $(t-T)u(t-T)$ (iii) $u(-t)$ (iv) $tu(t+T)$ **(06 Marks)**

Module-5

9 a. Determine the line currents and total power supplied to a delta connected load of $Z_{ab}=10\angle60°\,\Omega$, $Z_{bc}=20\angle90°\,\Omega$ and $Z_{ca}=25\angle30°\,\Omega$. Assume a 3 phase, 400 V, ABC system.   **(08 Marks)**

   b. Define Z and Y parameters.   **(04 Marks)**

   c. Find the Z parameters of the network shown in Fig. Q9 (c).   **(08 Marks)**
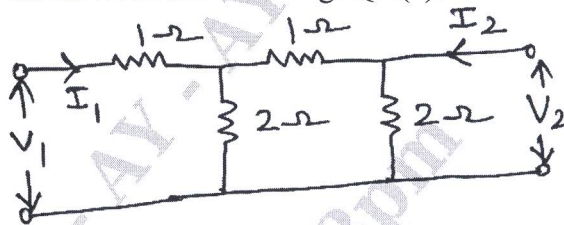

Fig. Q9 (c).

OR

10 a. Determine the line currents in an unbalanced star connected load supplied from a symmetrical 3 phase, 440 V system. The branch impedances are $Z_R=4\angle30^0\,\Omega$, $Z_Y=10\angle45^0\,\Omega$ and $Z_B=10\angle60^0\,\Omega$. The phase sequence is RYB.   **(08 Marks)**

   b. Find Y-parameters for the network shown in Fig. Q10 (b)   **(08 Marks)**
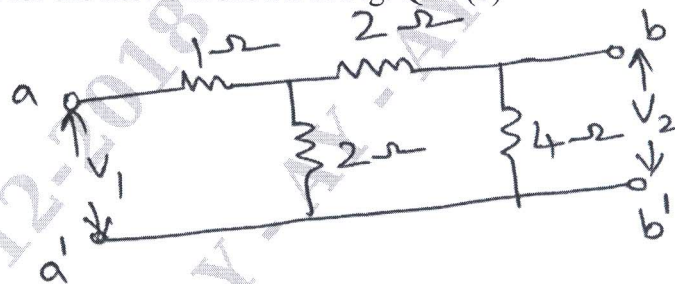

Fig. Q10 (b)

   c. Write the conditions for symmetry and reciprocity of Z and Y parameters of a two port network.   **(04 Marks)**

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