CBCS SCHEME

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18EC32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
Network Theory

Time: 3 hrs. Max. Marks: 100

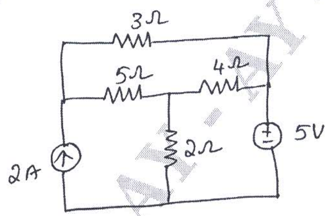
Note: Answer any FIVE full questions, choosing ONE full question from each module.

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

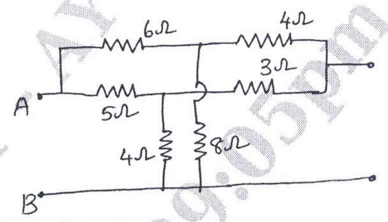
1 a. Using source transformation and source shifting techniques, find voltage across 2Ω resistor as shown in Fig.Q.1(a). **(07 Marks)**

Fig.Q.1(a)



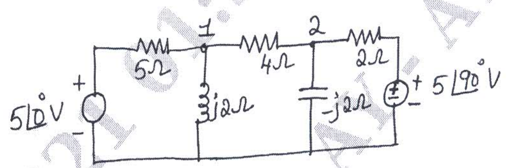
b. For the network shown in Fig.Q.1(b), find the equivalent resistance between A and B using Star-Delta transformation. **(05 Marks)**

Fig.Q.1(b)



c. Determine the node voltages V_1 and V_2 by nodal analysis for the network in Fig.Q.1(c). **(08 Marks)**

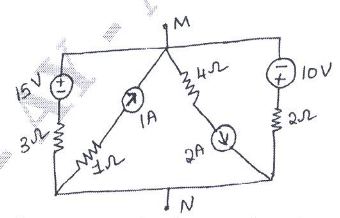
Fig.Q.1(c)



OR

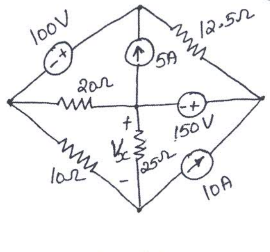
2 a. Find the potential difference between M and N using source transformation, for the network shown in Fig.Q.2(a). **(05 Marks)**

Fig.Q.2(a)



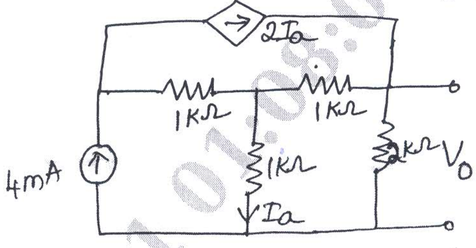
b. Find V_x using nodal analysis for the network shown in Fig.Q.2(b). **(08 Marks)**

Fig.Q.2(b)



c. Determine V_0 using mesh analysis for the network shown in Fig.Q.2(c). **(07 Marks)**

Fig.Q.2(c)

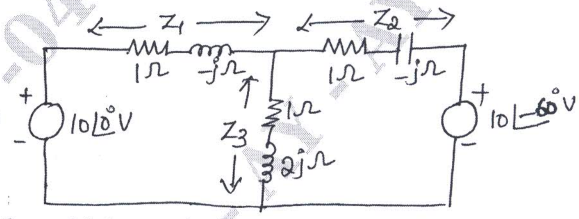


Module-2

3 a. State and prove Millman's theorem. **(06 Marks)**

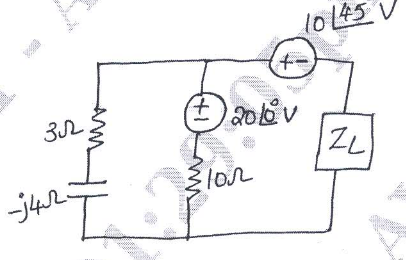
b. Find the current through Z_3 using superposition theorem for the network shown in Fig.Q.3(b). **(10 Marks)**

Fig.Q.3(b)



c. Find the value of Z_L for which maximum power transfer occurs in the network shown in Fig.Q.3(c). **(04 Marks)**

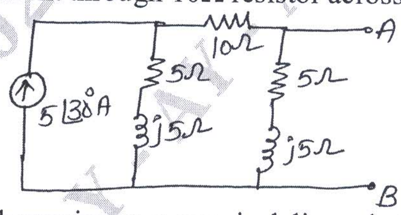
Fig.Q.3(c)



OR

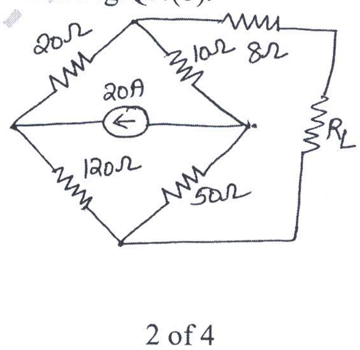
4 a. Obtain Thevenin's and Norton's equivalent circuit at terminals AB for the network shown in Fig.Q.4(a). Hence, find the current through 10Ω resistor across AB. **(12 Marks)**

Fig.Q.4(a)



b. Find the value of R_L for which maximum power is delivered. Also find the maximum power that is delivered to the load R_L. Refer Fig.Q.4(b). **(08 Marks)**

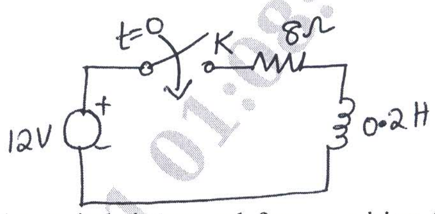
Fig.Q.4(b)



Module-3

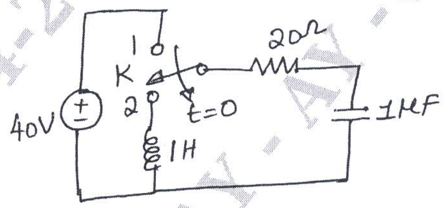
5 a. In the given network Fig.Q.5(a), K is closed at $t = 0$, with zero current in the inductor. Find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. **(05 Marks)**

Fig.Q.5(a)



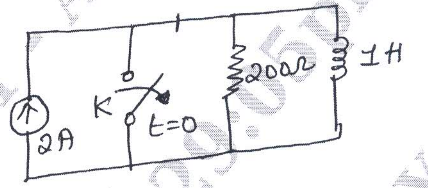
b. In the network Fig.Q.5(b), the switch is moved from position 1 to position 2 at $t = 0$. The steady-state has been reached before switching. Calculate i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. **(07 Marks)**

Fig.Q.5(b)



c. In the network Fig.Q.5(c), the switch K is opened at $t = 0$. At $t = 0^+$, solve for v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$. **(08 Marks)**

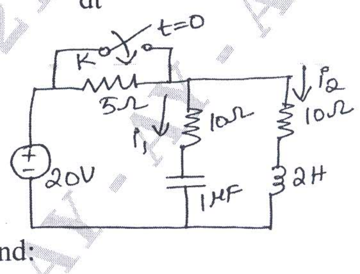
Fig.Q.5(c)



OR

6 a. For the circuit shown in Fig.Q.6(a), steady state is reached with switch K open. The switch is closed at $t = 0$. Find i_1, i_2, $\frac{di_1}{dt}$ and $\frac{di_2}{dt}$ at $t = 0^+$. **(10 Marks)**

Fig.Q.6(a)



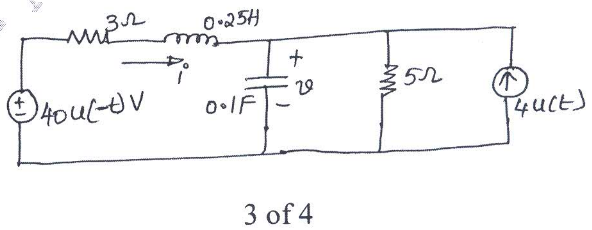
b. For the circuit in Fig.Q.6(b). Find:

i) $v(0^+)$ and $i(0^+)$

ii) $\frac{dv(0^+)}{dt}$ and $\frac{di(0^+)}{dt}$

iii) $v(\infty)$ and $i(\infty)$. **(10 Marks)**

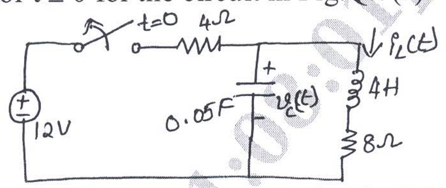
Fig.Q.6(b)



Module-4

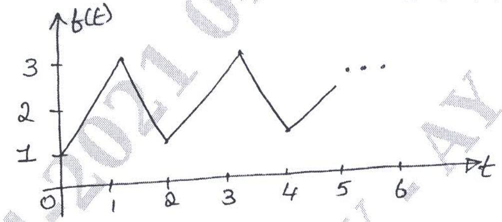
7 a. Determine the current $i_L(t)$ for $t \geq 0$ for the circuit in Fig.Q.7(a). **(10 Marks)**

Fig.Q.7(a)



b. Find the Laplace transform of the function f(t) shown in Fig.Q.7(b). **(10 Marks)**

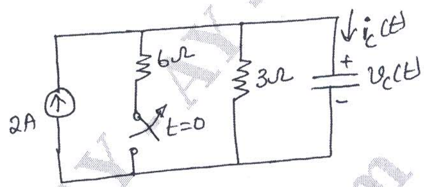
Fig.Q.7(b)



OR

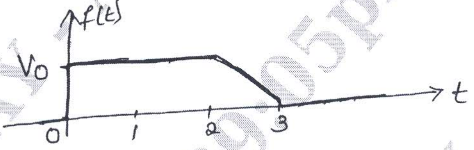
8 a. Determine the voltage $v_c(t)$ and the current $i_c(t)$ for $t \geq 0$ for the circuit shown in Fig.Q.8(a). **(10 Marks)**

Fig.Q.8(a)



b. Find the Laplace transform of f(t) shown in Fig.Q.8(b). **(10 Marks)**

Fig.Q.8(b)



Module-5

9 a. Express Y parameters in terms of h-parameters. **(06 Marks)**

b. Find Z-parameters for the network shown in Fig.Q.9(b). **(06 Marks)**

Fig.Q.9(b)

c. The Z-parameters of a two port network are $z_{11} = 20\Omega$, $z_{22} = 30\Omega$, $z_{12} = z_{21} = 10\Omega$. Find Y and ABCD parameters of the network. **(08 Marks)**

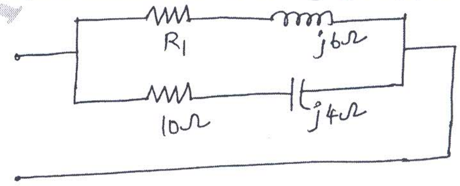
OR

10 a. Prove that the resonant frequency is the geometric mean of the two half power frequencies. **(06 Marks)**

b. A series RLC circuit has $R = 10\Omega$, $L = 0.01H$ and $C = 0.01\mu F$ and it is connected across 10mv supply. Calculate: i) f_0 ii) Q_0 iii) bandwidth iv) f_1 and f_2 v) I_0. **(06 Marks)**

c. Find the value of R_1 such that the circuit shown in Fig.Q.10(c) is resonant. **(08 Marks)**

Fig.Q.10(c)



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