CBCS SCHEME

USN | | | | | | | | | | |

15EE32

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
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. Find the power delivered by 20 volts voltage source using source transformation technique for the circuit given in Fig Q1(a).

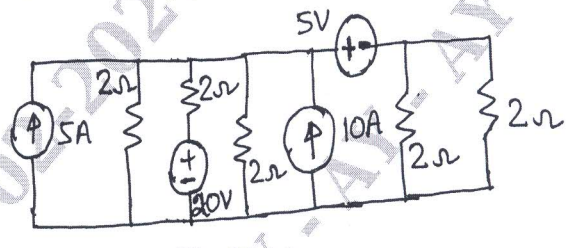

Fig Q1(a) **(08 Marks)**

b. Determine the voltage 'V_a' for the circuit shown in Fig Q1(b) using mesh analysis.

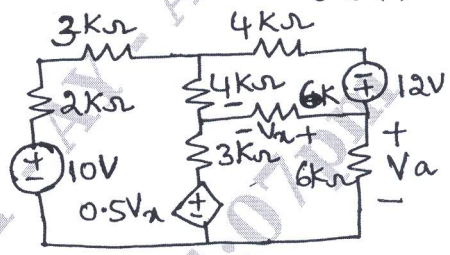

Fig Q1(b) **(08 Marks)**

OR

2 a. Obtain the equivalent resistance between the terminates X and Y using star-Delta transformation for the circuit shown in Fig Q2(a)

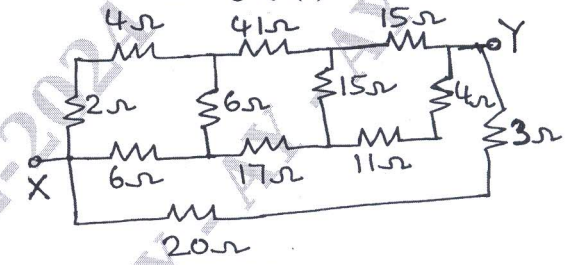

Fig Q2(a) **(06 Marks)**

b. Find the node voltages for the circuit shown in Fig Q2(b), using nodal analysis

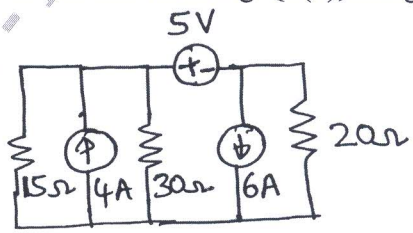

Fig Q2(b) **(06 Marks)**

c. A series R-L-C circuit has the following parameter values: R = 10Ω, L = 0.01H and C = 100μF. Compute the resonant frequency, quality factor of the circuit, bandwidth, lower and upper frequency of the bandwidth. **(04 Marks)**

Module-2

3 a. Find current through the (3 + j4)Ω impedance using superposition theorem for the circuit shown in Fig Q3(a)

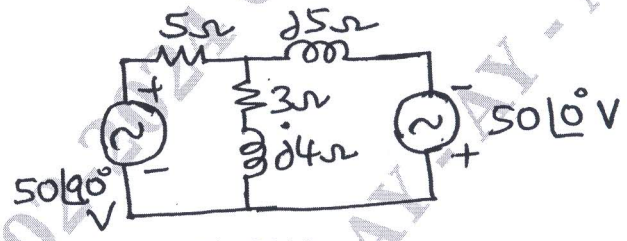

Fig Q3(a) **(08 Marks)**

b. Find I_L, using Thevenin's theorem the circuit in Fig Q3(b)

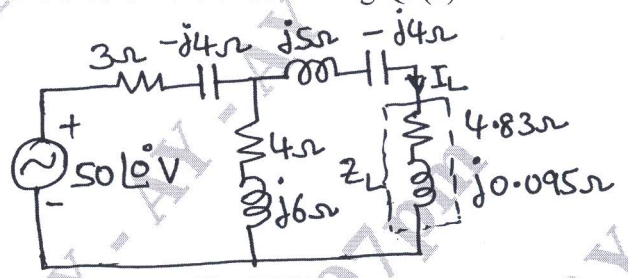

Fig Q3(b) **(08 Marks)**

OR

4 a. Determine I_L in circuit Fig Q4(a) using Millman's theorem.

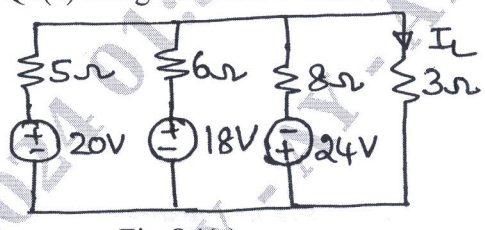

Fig Q4(a) **(08 Marks)**

b. For the circuit shown in Fig Q4(b), find the value of the resistance R_L for maximum power transfer and calculate the maximum power.

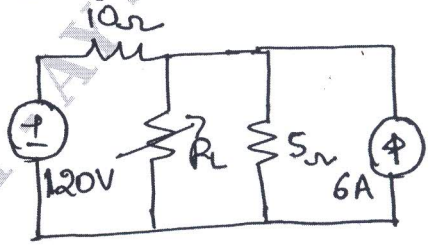

Fig Q4(b) **(08 Marks)**

Module-3

5 a. In the circuit shown in Fig Q5(a) the switch is changed from the position 'a' to 'b' at t = 0. Find i(t), $\frac{di}{dt}(t)$ and $\frac{d^2i}{dt^2}(t)$ at $t = 0^+$.

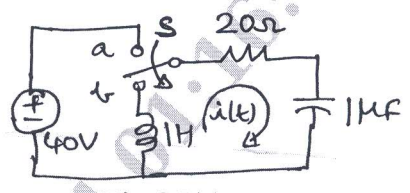

Fig Q5(a) **(08 Marks)**

b. Determine v(t), $\frac{dv}{dt}(t)$ and $\frac{d^2v}{dt^2}(t)$ at $t = 0^+$ for the circuit shown in Fig Q5(b), when the switch in closed at t = 0.

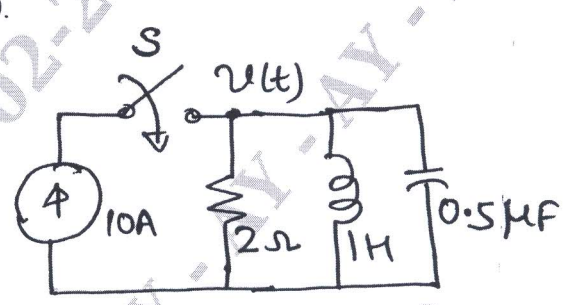

Fig Q5(b) **(08 Marks)**

OR

6 a. In the circuit shown in Fig Q6(a), a steady state is reached when the switch is open, At t = 0, the switch is closed. Find the value of $V_a = (0^-)$, $V_b(0^-)$, $V_a(0^+)$ and $V_b(0^+)$.

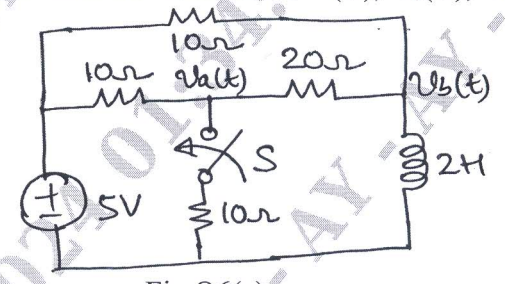

Fig Q6(a) **(08 Marks)**

b. Explain the behaviour of R.L.C elements at the time of switching at t = 0 both at $t = 0^+$ and $t = \infty$ **(08 Marks)**

Module-4

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

b. Find the Laplace transform of i(t), for the waveform shown in Fig Q7(b).

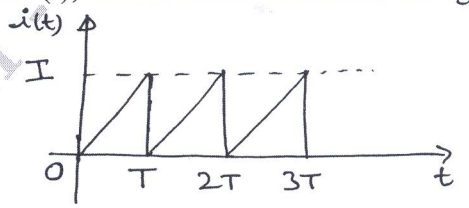

Fig Q7(b) **(08 Marks)**

OR

8 a. Apply Initial value theorem to
 i) $f(t) = 10\ell^{5t}$
 ii) $5\ \text{Sin}3t$
 iii) $5 - \ell^{-3t}$ **(08 Marks)**

b. Find the final value of
 i) $\dfrac{2s+5}{(s+1)(s+2)}$
 ii) $f(t) = 2 + \ell^{-3t}\ \text{Cos}\ 2t$ **(08 Marks)**

Module-5

9 a. Determine the line currents in a unbalanced star connected supplied from a symmetrical 3-phase, 4-wire, 440V system. The branch impedances of the load are $Z_A = 5\ \angle 30°\ \Omega$, $Z_B = 10\angle 45°\ \Omega$ and $Z_C = 10\angle 60°\ \Omega$. The phase sequence is ABC. **(08 Marks)**

b. Find the Z and Y parameters of the circuit shown in Fig Q9(b)

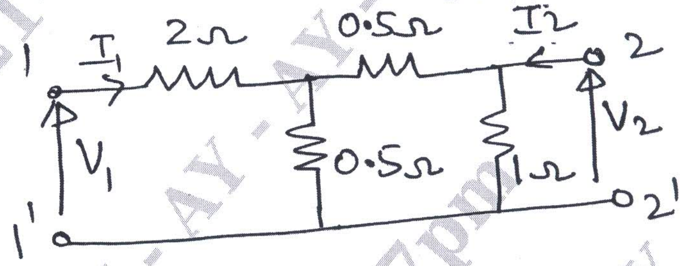

Fig Q9(b) **(08 Marks)**

OR

10 a. Define ABCD and Hybrid parameters. **(08 Marks)**

b. Using Millman's theorem, find the phase voltages of a 3-phase, 3-wire unbalanced star-connected load. **(08 Marks)**

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