CBCS SCHEME

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

18EC32

Third Semester B.E. Degree Examination, Dec.2023/Jan.2024
Network Theory

Time: 3 hrs. Max. Marks: 100

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

Module-1

1 a. Define the following network terminology
i) Network element ii) Branch iii) Node iv) Mesh. **(08 Marks)**

b. Determine the voltage at node 2 in the circuit shown in Fig Q1(b) source transformation.

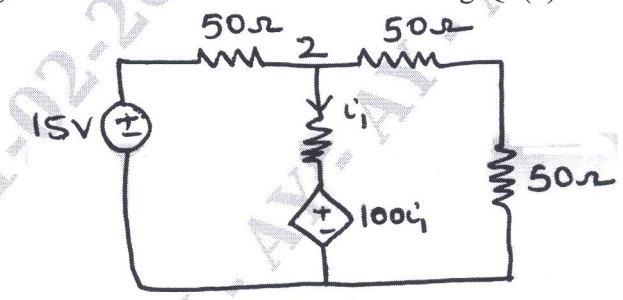

Fig Q1(b) **(06 Marks)**

c. Determine the equivalent resistance between the terminals A and B for the circuit shown in Fig Q1(c).

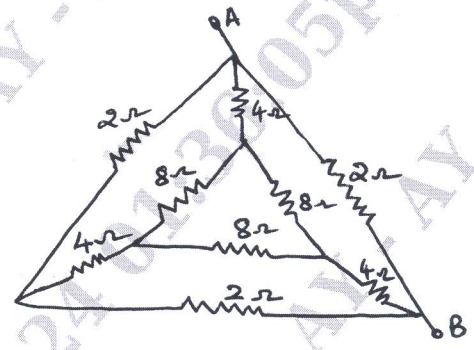

Fig Q1(c) **(06 Marks)**

OR

2 a. Obtain expressions to convert star connected impedances into equivalent delta connected impedances. **(06 Marks)**

b. Determine V_2 which results in zero current 8Ω resistor using mesh analysis for the circuit shown in Fig Q2(b)

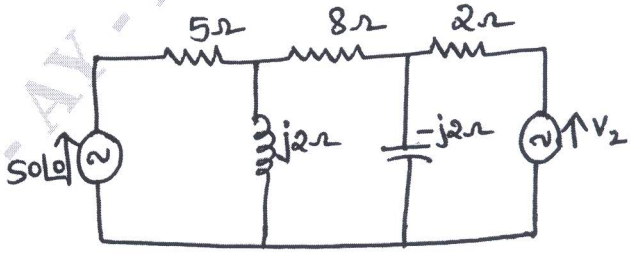

Fig Q2(b) **(07 Marks)**

c. Determine V_1, V_2, V_3 for the network shown in Fig Q2(c) using nodal analysis.

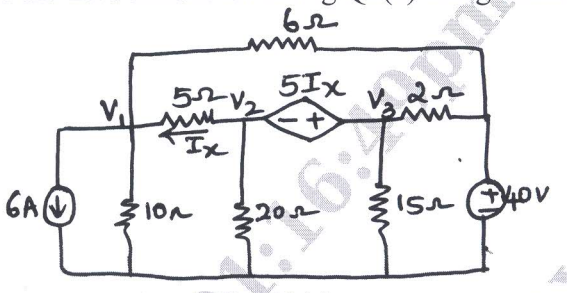

Fig Q2(c) **(07 Marks)**

Module-2

3 a. Obtain Thevenins and Nortan's equivalent circuit for the network shown in Fig Q3(a)

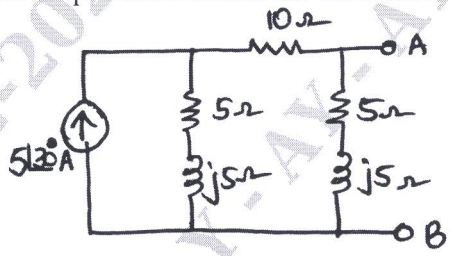

Fig Q3(a) **(08 Marks)**

b. State and explain maximum power transfer theorem. **(05 Marks)**

c. Determine the voltage V_x across 30Ω resistor using superposition theorem for the network shown in Fig Q3(c)

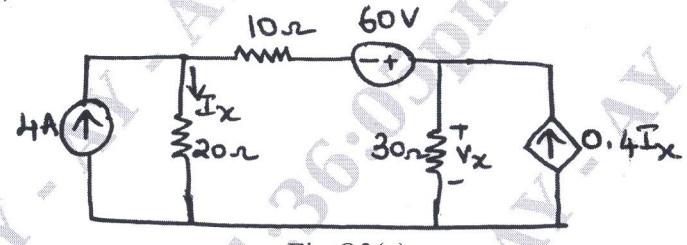

Fig Q3(c) **(07 Marks)**

OR

4 a. Find V_x using Thevenins theorem for the network shown in Fig Q4(a)

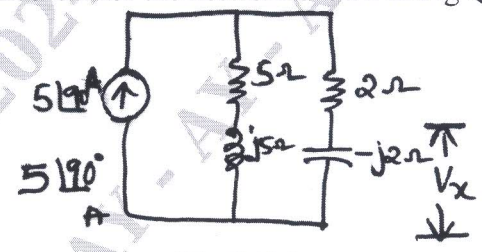

Fig Q4(a) **(06 Marks)**

b. Determine the value of R_L when maximum power is transferred across it. Also find the power transfer in the circuit. Shown in Fig Q4(b)

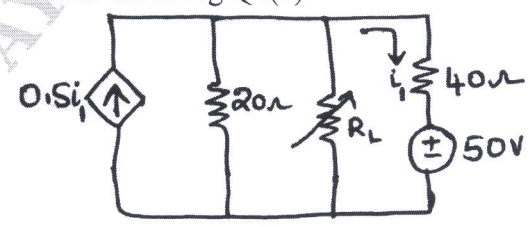

Fig Q4(b) **(08 Marks)**

c. Determine current through R_L using Nortan's theorem for the network shown in Fig Q4(c)

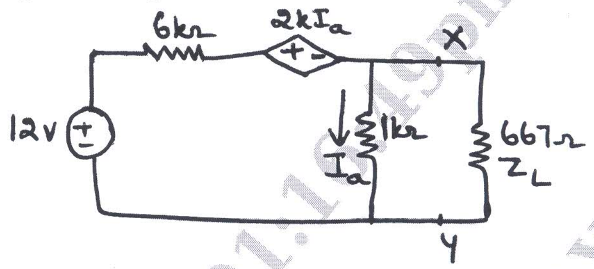

Fig Q4(c) **(06 Marks)**

Module-3

5 a. Explain the behaviour of R, L and C elements for transients. Mention their representation at the instant of switching. **(06 Marks)**

b. Determine i, $\frac{di}{dt}$, $\frac{d^2t}{dt^2}$ at $t = 0^+$ for the network shown in Fig Q5(b) when switch K is changed from position 1 to 2 at t = 0, steady state condition having reached before switching.

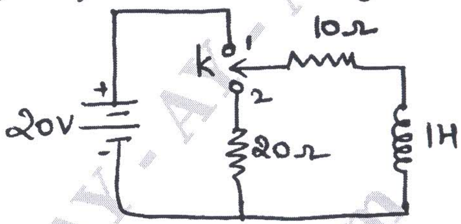

Fig Q5(b) **(07 Marks)**

c. For the network shown in Fig Q5(c), steady state is reached with switch K-open. Switch is closed at t = 0, solve for i_1, i_2, $\frac{di_1}{dt}$, $\frac{di_2}{dt}$ at $t = 0^+$.

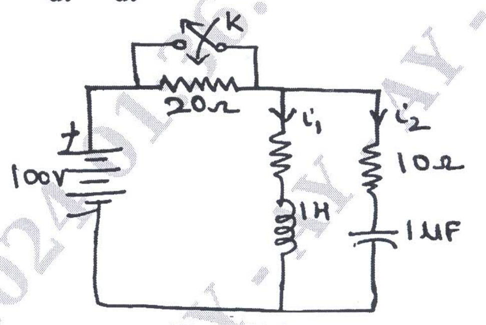

Fig Q5(c) **(07 Marks)**

OR

6 a. Derive an expression for transient response of series RC circuit for DC excitation. **(06 Marks)**

b. Determine the voltage $V_R(t)$ and $V_c(t)$ for $t \geq 0$ when switch is moved from position 1 to 2 for the network shown in Fig Q6(b)

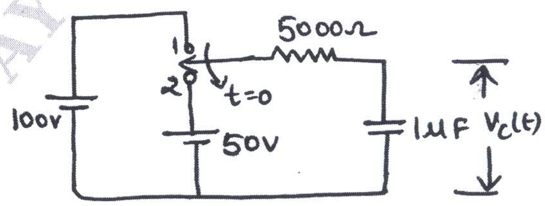

Fig Q6(b) **(08 Marks)**

c. For the network shown in Fig Q6(c), switch K is changed from 1 to 2 at t = 0, steady state having been attained in position 1. Find the values of i, $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at t = 0.

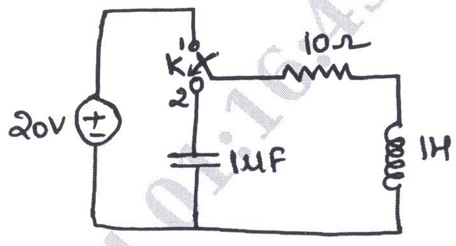

Fig Q6(c) **(06 Marks)**

Module-4

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

b. Determine Laplace transform of the function shown in Fig Q7(b)

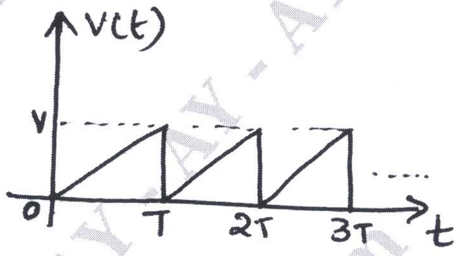

Fig Q7(b) **(06 Marks)**

c. Obtain Laplace transform of (i) δ(t) (ii) u(t) (iii) t (iv) Sinwt **(08 Marks)**

OR

8 a. Obtain Laplace transform for the waveform shown in Fig Q8(a)

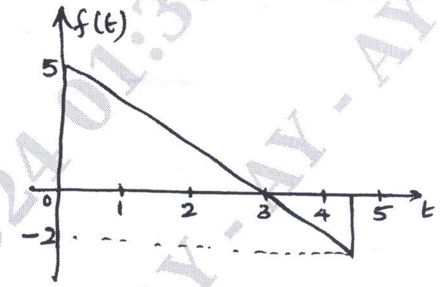

Fig Q8(a) **(08 Marks)**

b. Determine the relation between unit step and unit ramp function. **(04 Marks)**

c. Synthesize the waveform and find the Laplace transform of the waveform shown in Fig Q8(c)

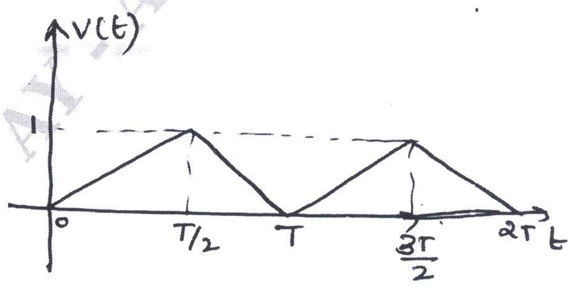

Fig Q8(c) **(08 Marks)**

Module-5

9 a. Obtain Z-parameters interms of Y-parameters. **(06 Marks)**

b. A series RLC circuit has R = 4Ω, L = 1mH, C = 10μF, calculate Q-factor, Bandwidth, resonating frequency half power frequency. **(06 Marks)**

c. Determine ABCD parameters for the network shown in Fig Q9(c)

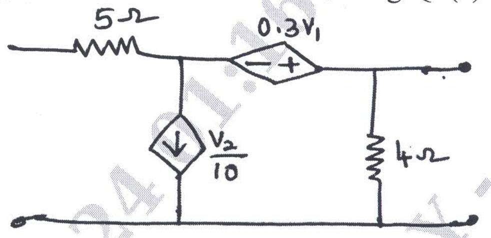

Fig Q9(c) **(08 Marks)**

OR

10 a. Derive an expression for resonant frequency of the circuit shown in Fig Q10(a)

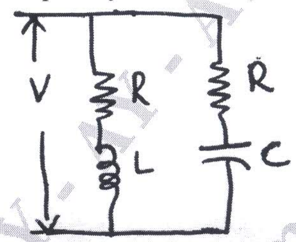

Fig Q10(a) **(06 Marks)**

b. Determine H-parameters and Y-parameters for the network shown in Fig Q10(b)

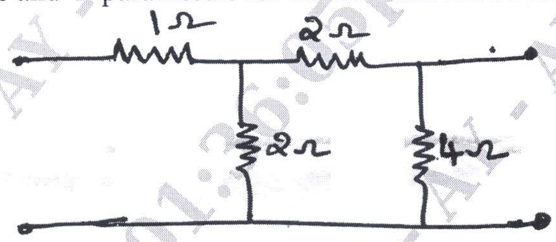

Fig Q10(b) **(08 Marks)**

c. Determine the value of R such that the circuit in Fig Q10(c) is resonant.

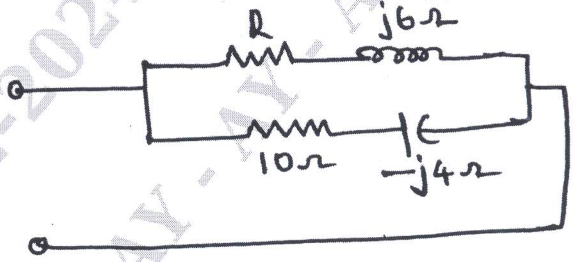

Fig Q10(c) **(08 Marks)**

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