CBCS SCHEME

USN

18EC32

Third Semester B.E. Degree Examination, June/July 2025
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. For the network shown in Fig.Q.1(a), convert using source transformation/shifting technique to find current 'I'.

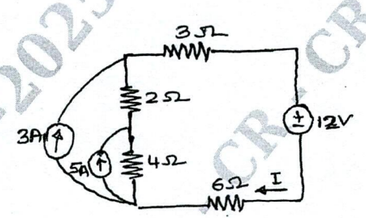

Fig.Q.1(a)

(06 Marks)

b. Using Star-Delta transformation, find equivalent resistance of network shown in Fig.Q.1(b) between terminal AB.

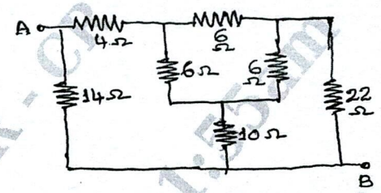

Fig.Q.1(b)

(07 Marks)

c. For the network shown in Fig.Q.1(c), using super mesh concept to determine current I.

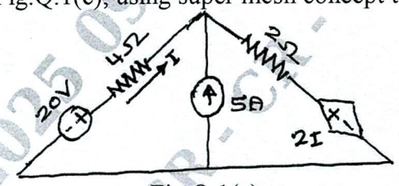

Fig.Q.1(c)

(07 Marks)

OR

2 a. Find the voltages of three non-reference nodes of the network shown in Fig.Q.2(a).

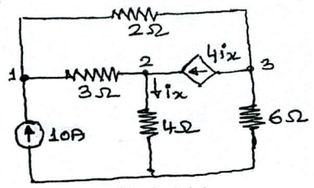

Fig.Q.2(a)

(06 Marks)

b. Using mesh analysis determine all the loop current for the network shown in Fig.Q.2(b).

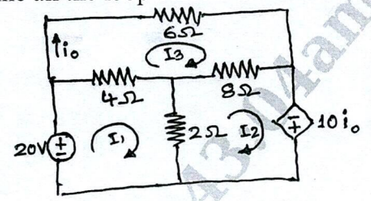

Fig.Q.2(b)

(07 Marks)

c. Using supernode concept, determine all non reference node voltages for the network shown in Fig.Q.2(c).

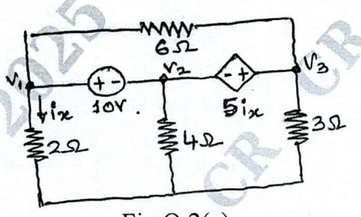

Fig.Q.2(c)

(07 Marks)

Module-2

3 a. State and prove "Super position theorem". **(06 Marks)**

b. Refer to the circuit shown in Fig.Q.3(b). Use Millman's theorem to find current through $(5 + j5)\Omega$.

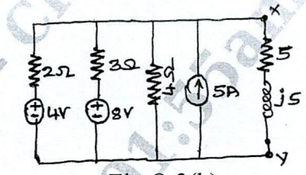

Fig.Q.3(b)

(07 Marks)

c. Find the Thevenin's equivalent network for circuit shown in Fig.Q.3(c).

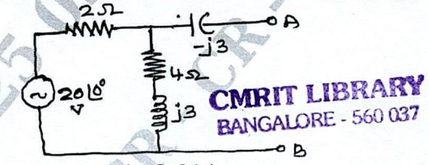

Fig.Q.3(c)

(07 Marks)

OR

4 a. Find the Norton's equivalent between terminals PQ of network shown in Fig.Q.4(a).

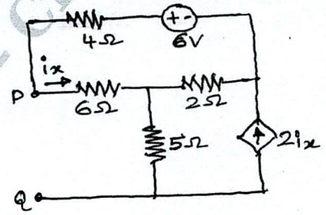

Fig.Q.4(a)

(07 Marks)

b. Refer to the circuit shown in Fig.Q.4(b). Find "γ_x" using superposition theorem.

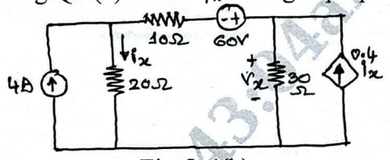

Fig.Q.4(b)

(06 Marks)

c. Find the value of load "Z_L" for which maximum power is delivered to the load of network shown in Fig.Q.3(c). **(07 Marks)**

Module-3

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

b. In the circuit shown in Fig.Q.5(b), the switch is closed at t = 0; find $i_1, i_2, \frac{di_1}{dt}$ and $\frac{di_2}{dt}$ at $t = 0+$

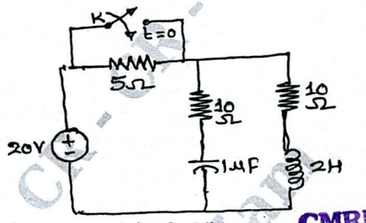

Fig.Q.5(b)

(07 Marks)

c. For the network shown in Fig.Q.5(c). The switch K is closed at t = 0. Steady state having been reached before switching. Calculate i, di/dt and d^2i/dt^2 at t = 0+

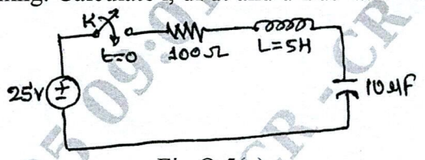

Fig.Q.5(c)

(07 Marks)

OR

6 a. Explain the significance of study of initial condition theory, list the procedures for evaluating initial conditions. **(06 Marks)**

b. In the circuit shown in Fig.Q.6(b), a steady state is reached with switch 'K' open. AT t = 0 the switch is closed. For elements given values, determine value of $\gamma_a(0-)$ and $\gamma_a(0+)$.

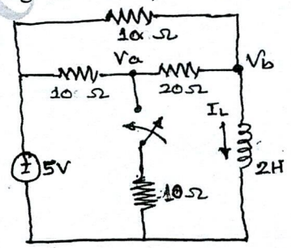

Fig.Q.6(b)

(07 Marks)

c. How is time constant of RL circuit defined? Explain its importance in transient analysis, with suitable examples. **(07 Marks)**

Module-4

7 a. What are three important singularity functions? Write brief note on each with necessary mathematical expression with sketches. **(06 Marks)**

b. List the various properties of Laplace transforms and prove the below properties:
i) Linearity ii) Time shifting **(07 Marks)**

c. Consider the RC circuit shown in Fig.Q.7(c). The input is the rectangular pulse shown in Fig.Q.7(c), find i(t) by assuming circuit is initially relaxed.

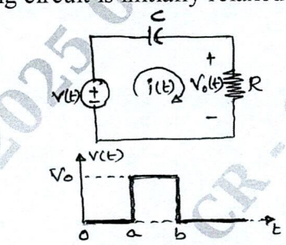

Fig.Q.7(c)

(07 Marks)

OR

8 a. Find the Laplace transform of periodic signal x(t) shown in Fig.Q.8(a). **(10 Marks)**

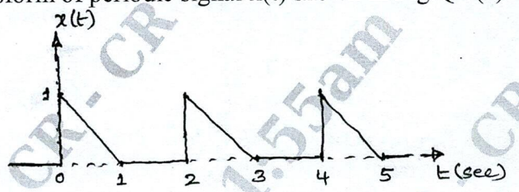

Fig.Q.8(a)

b. Refer the circuit shown in Fig.Q.8(b). Find i(0) and i(∞) using initial and final value theorem. **(10 Marks)**

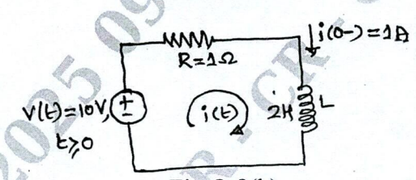

Fig.Q.8(b)

Module-5

9 a. Refer the network shown in Fig.Q.9(a), find open circuit parameter for the network and take $\gamma_s = 10v$.

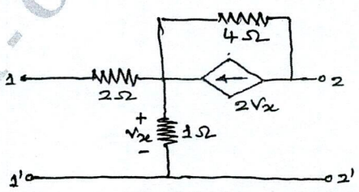

Fig.Q.9(a)

(10 Marks)

b. Refer to the network shown in Fig.Q.9(b). Find h-parameters. Find also calculate short circuit parameter using h-parameter results. **(10 Marks)**

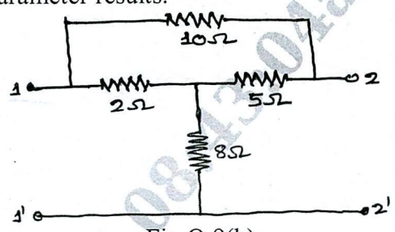

Fig.Q.9(b)

OR

10 a. Derive for series resonant circuit, the resonant frequency $f_0 = \sqrt{f_1 f_2}$, where f_1 and f_2 are half power frequencies. **(06 Marks)**

b. A parallel resonant circuit has fixed capacitor and variable inductor having constant quality factor of 4. Find the value of inductor and capacitance for circuit impedance of 1000Ω at resonating frequency of 2.4 MHz. What is the bandwidth of circuit? **(07 Marks)**

c. Sketch the variation of current and impedance with frequency of series resonant circuit and give brief note on same. **(07 Marks)**

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