

Third Semester B.E. Degree Examination, June/July 2024 Network Theory

Max. Marks: 100

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

Module-1

- 1 a. Derive the expression for,
 - (i) Δ to Y transformation (10 Marks)
 - (ii) Y to Δ transformation (10 Marks)
- b. Determine the equivalent resistance between A and B of the network shown in Fig. Q1 (b). (10 Marks)

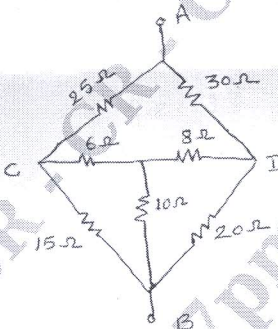


Fig. Q1 (b)

OR

- 2 a. Determine the current i_2 and voltage v_1 for the circuit shown in Fig. Q2 (a). (10 Marks)

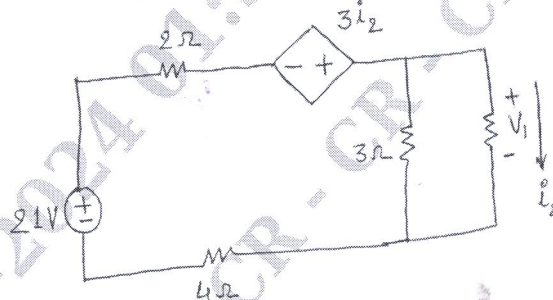


Fig. Q2 (a)

- b. Determine the value of V_2 , such that current through $4\ \Omega$ resistor is zero, using mesh current analysis method for the network shown in Fig. Q2 (b). (10 Marks)

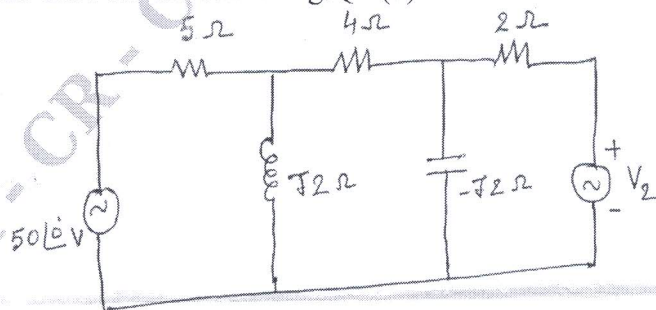


Fig. Q2 (b)

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-2

- 3 a. State Super position theorem. Using superposition theorem, find the voltage V_1 across 3Ω resistor for the Network shown in Fig. Q3 (a). (10 Marks)

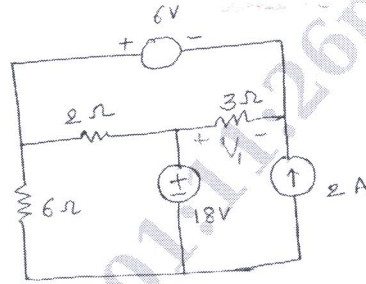


Fig. Q3 (a)

- b. Evaluate the current through the load resistor R_L for the circuit shown in Fig. Q3 (b) using Millman's Theorem. (10 Marks)

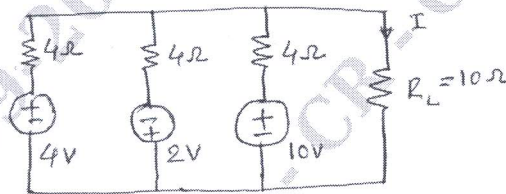


Fig. Q3 (b)

OR

- 4 a. Explain the procedure to find Norton's equivalent resistance in a network which has both dependent and independent sources with an example. (06 Marks)
- b. Find the value of Z_L for which maximum power transfer occurs in the circuit shown in Fig. Q4 (b). (04 Marks)

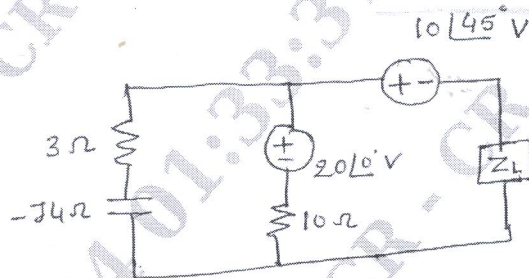


Fig. Q4 (b)

- c. Determine the current flowing through the 6Ω resistor for the circuit shown in Fig. Q4 (c) using Thevenin's theorem. (10 Marks)

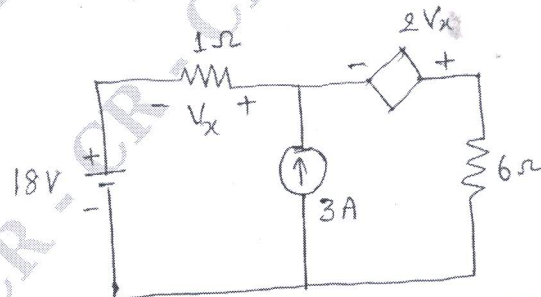


Fig. Q4 (c)

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Module-3

- 5 a. Explain the transient behavior of R, L and C. Also explain the procedure for evaluating transient behavior. (10 Marks)

- b. In the circuit shown in Fig. Q5 (b) the switch 'S' is moved from a to b at $t = 0$. Evaluate the values of i , $\frac{di}{dt}$, $\frac{d^2i}{dt^2}$ at $t = 0^+$. If $R = 1 \Omega$, $L = 1 \text{ H}$, $C = 0.1 \mu\text{F}$ and $V = 100 \text{ V}$. Assume steady state is achieved when K is at 'a'. (10 Marks)

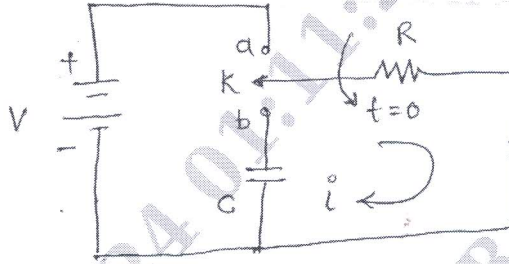


Fig. Q5 (b)

OR

- 6 a. Evaluate i , $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ for the circuit shown in Fig. Q6 (a), when switch K is changed from position 1 to 2 at $t = 0$, the steady state having been reached before switching. (10 Marks)

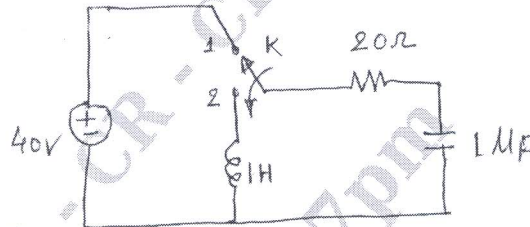


Fig. Q6 (a)

- b. Find the values of $i_1, i_2, \frac{di_1}{dt}, \frac{di_2}{dt}, \frac{d^2i_1}{dt^2}$ and $\frac{d^2i_2}{dt^2}$ at $t = 0^+$ for the circuit shown in Fig. Q6 (b). (10 Marks)

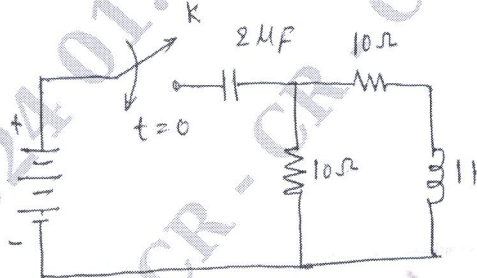


Fig. Q6 (b)

Module-4

- 7 a. Obtain Laplace transform of,
 (i) Step function
 (ii) Ramp function
 (iii) Impulse function.

(10 Marks)

b. Find the Laplace transform of the periodic waveform shown in Fig. Q7 (b).

(10 Marks)

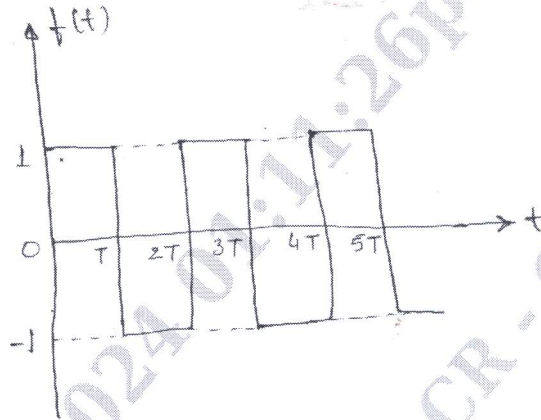


Fig. Q7 (b)

OR

8 a. Deduce the Laplace transform of the following :

- (i) $\sin^2 t$
- (ii) $\cos^2 t$
- (iii) $\sin \omega t$

(10 Marks)

b. State and prove Initial and Final value theorems.

(10 Marks)

Module-5

9 a. Express Z-parameters in terms of h-parameters and what are hybrid parameters.

(10 Marks)

b. Determine the transmission parameters for the network shown in Fig. Q9 (b).

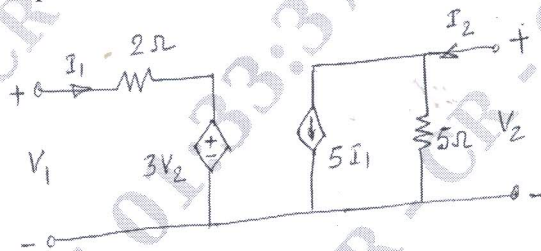


Fig. Q9 (b)

(10 Marks)

OR

10 a. Define the followings :

- (i) Resonance
- (ii) Q-factor
- (iii) Band width
- (iv) Selectivity.

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(08 Marks)

b. Prove that the resonating frequency in a R-L-C series circuit is geometrical mean of half power frequencies is $f_0 = \sqrt{f_1 f_2}$.

(12 Marks)
