

CBCS SCHEME

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21EC43

Fourth Semester B.E. Degree Examination, June/July 2023 Circuits and Controls

Time: 3 hrs.

Max. Marks: 100

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

Module-1

- 1 a. Find the loop currents i_1 and i_2 for the circuit shown in Fig.Q1(a).

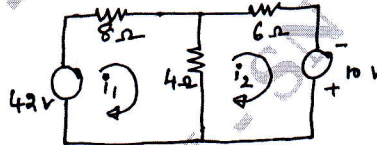


Fig.Q1(a)

(10 Marks)

- b. Explain the verification of superposition with suitable circuit.

(10 Marks)

OR

- 2 a. State and explain Thevenin's theorem. (10 Marks)
b. Solve and obtain Norton's equivalent circuit for the circuit shown in Fig.Q2(b).

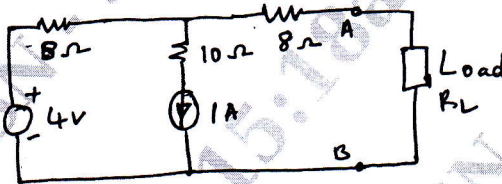


Fig.Q2(b)

(05 Marks)

- c. Explain briefly node analysis method by considering suitable two loop DC circuit. (05 Marks)

Module-2

- 3 a. Find Z-parameters for the network shown in Fig.Q3(a).

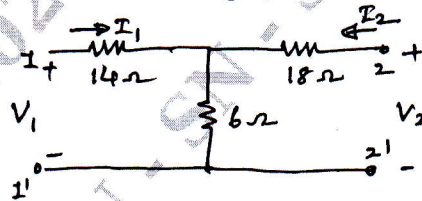
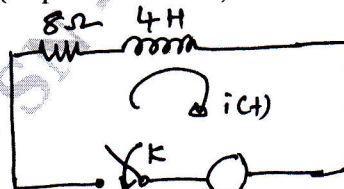


Fig.Q3(a)

(10 Marks)

- b. Find $i(t)$ for the circuit shown in Fig.Q3(b) using Laplace Transform when the switch K is closed and $V(t) = \delta(t)$ (Impulse function).



$V(t) = \delta(t)$, $\delta(t)$ is impulse function

Fig.Q3(b)

(10 Marks)

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.

OR

- 4 a. Find Y-parameters for the network shown in Fig.Q4(a).

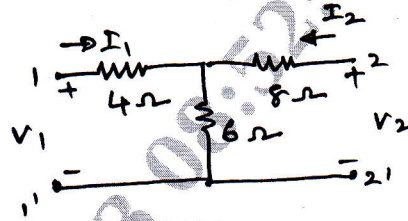


Fig.Q4(a)

(10 Marks)

- b. State and explain Initial Value Theorem. (10 Marks)

Module-3

- 5 a. Explain the different types of control system. (10 Marks)
 b. Find the transfer function for the RLC circuit shown. Assume Initial condition as zero. RLC circuit consists of voltage source of V_i as show in the Fig.Q5(b) and find $\frac{V_o(s)}{V_i(s)}$.

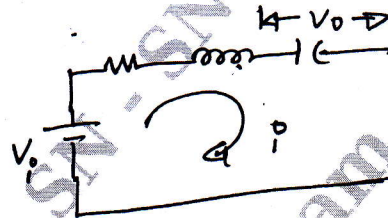


Fig.Q5(b)

(10 Marks)

OR

- 6 a. Find the transfer function $\frac{C}{R}$ for the block diagram as shown in Fig.Q6(a).

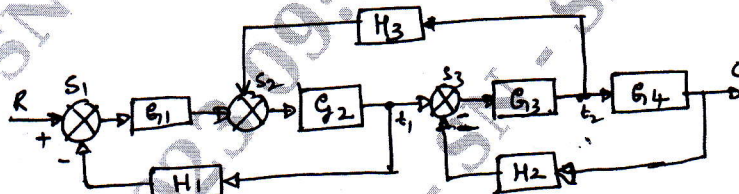


Fig.Q6(a)

(10 Marks)

- b. Find the transfer function $\left(\frac{C}{R}\right)$ for the signal flow graph shown in Fig.Q6(b).

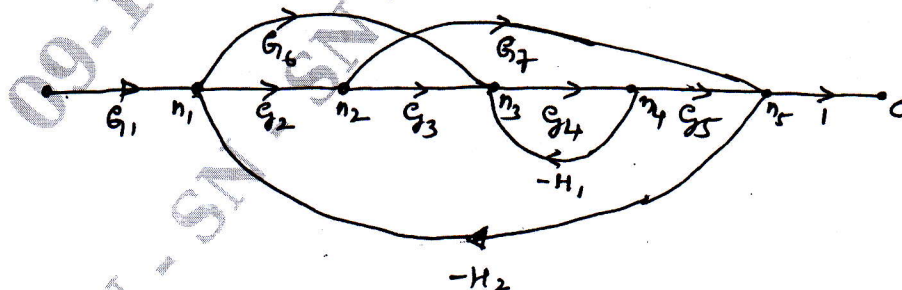


Fig.Q6(b)

(10 Marks)

Module-4

7 a. Find the output $c(t)$ for the first order system, where

$$G(s) = \frac{a}{s+a} \quad \text{and} \quad R(s) = \frac{1}{s}$$

(10 Marks)

b. Explain the concept of stability and its stability necessary conditions.

(10 Marks)

OR

8 a. Explain with a neat diagram of time response of second order system unit step function. Explain any five time specifications. (10 Marks)

b. Find the range of K for system stability. Given

$$G(s) = \frac{K}{(s+2)(s+4)(s^2+6s+25)} \quad \text{and} \quad H(s) = 1.$$

(10 Marks)

Module-5

9 a. Explain any four root locus plot rules. (10 Marks)

b. Find the state model of the given electrical system as shown in Fig.Q9(b).

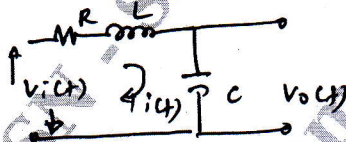


Fig.Q9(b)

Take state variables $X_1(t) = i(t)$ and $X_2(t) = V_o(t)$.

(10 Marks)

OR

10 a. Find the state transition matrix for $A = \begin{bmatrix} 0 & -1 \\ 2 & -3 \end{bmatrix}$

(10 Marks)

b. Find the T. F (Transfer function) for the magnitude plot as shown in Fig.Q10(b).

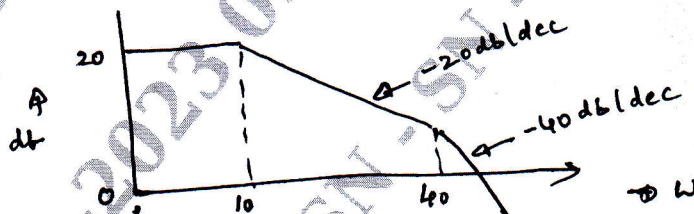


Fig.Q10(b)

(10 Marks)
