CBCS SCHEME

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

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).

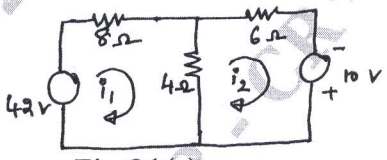

Fig.Q1(a) **(10 Marks)**

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).

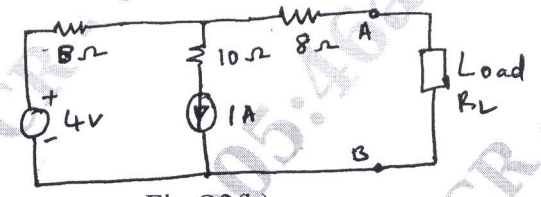

Fig.Q2(b) **(05 Marks)**

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).

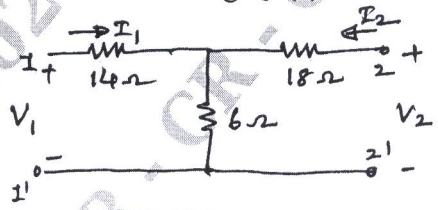

Fig.Q3(a) **(10 Marks)**

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).

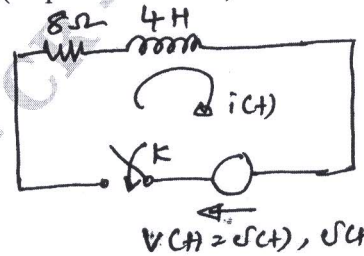

Fig.Q3(b) **(10 Marks)**

OR

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

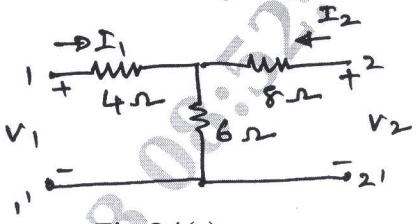

Fig.Q4(a) **(10 Marks)**

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 $\frac{V_0(s)}{V_i(s)}$.

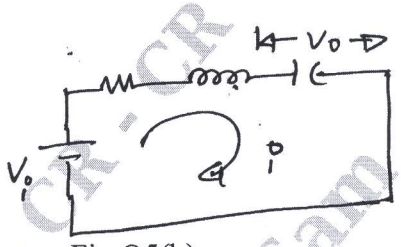

Fig.Q5(b) **(10 Marks)**

OR

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

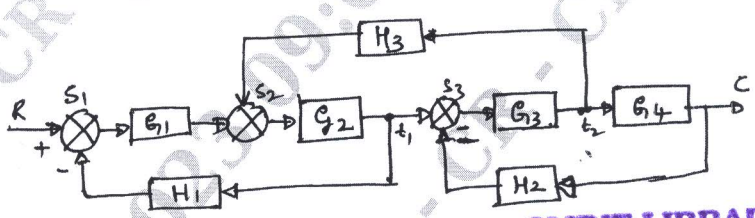

Fig.Q6(a) **(10 Marks)**

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

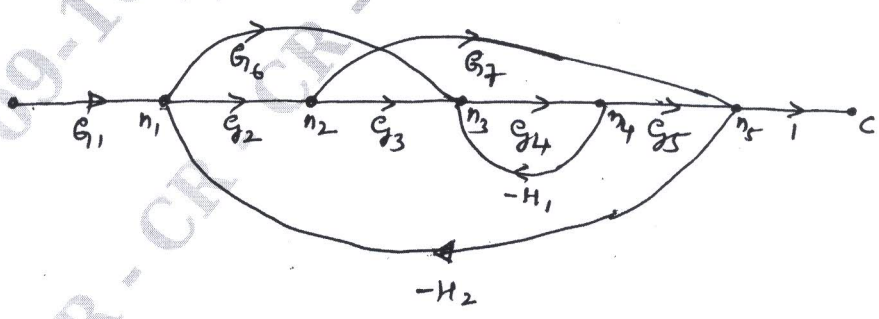

Fig.Q6(b) **(10 Marks)**

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).

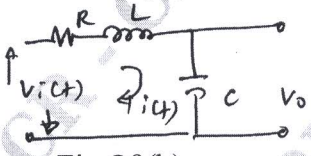

Fig.Q9(b)

Take state variables $X_1(t) = i(t)$ and $X_2(t) = V_0(t)$. **(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).

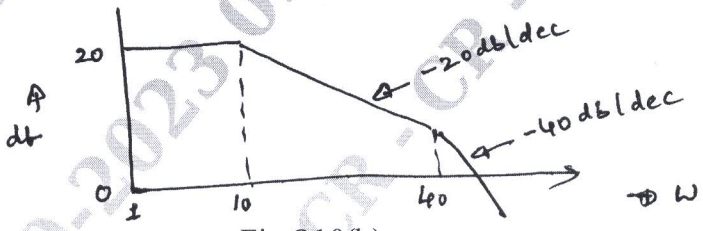

Fig.Q10(b) **(10 Marks)**

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