

1078
B. Engg. (Mechanical Engg.)
7th Semester
MEC-702: Automatic Controls

Time allowed: 3 Hours

Max. Marks: 50

NOTE: Attempt five questions in all, including Q. No. 1 which is compulsory and selecting atleast two questions from each Unit. Use of calculator is allowed.

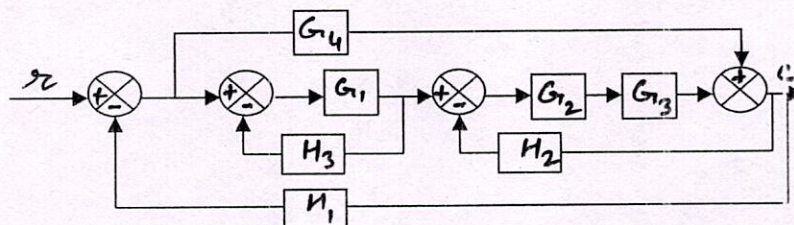
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- I. (a) Draw schematic of a hydraulic service motor.
- (b) Draw circuit diagram of a field.
- (c) Explain Mason's formula.
- (d) Explain Laplace transform representation.
- (e) What all can be done using Lab view. (5×2)

UNIT-I

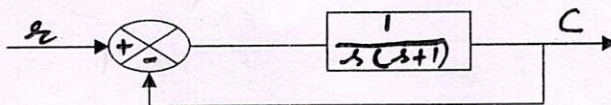
- II. Consider armature controlled DC motor. Draw circuit diagram. Write governing equations. Draw block diagram in closed loop to control position of output shaft. Derive overall transfer function. (10)

III.



Draw signal flow diagram. Draw overall transfer function using Mason's formula. Check transfer function by block diagram algebra. (10)

- IV. Draw Nyquist diagram for the control system with the block diagram shown below:



Comment on stability. (10)

UNIT-II

- V. Find the solution for the following state equations:

$$\{x(t)\} = \begin{bmatrix} 0 & 1 \\ -3 & -4 \end{bmatrix} \{x\} + \begin{bmatrix} 0 \\ 2 \end{bmatrix} v(t)$$

Where initial condition $[x(0)] = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ (10)

P.T.O.

(2)

- VI. Obtain a state-space representation of $\frac{Y(s)}{U(s)} = \frac{5(1-s)}{(s+8)(s+3)}$. Also, find expression for output $y(t)$ for a unit step input $v(t)$. Take initial conditions as zero. (10)
- VII. Draw program in Labview to solve state-space model of system detailed in question number (VI). (10)

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