Seat No.

Total No. of Pages : 3

MAR_APR 2025 SUMMER EXAMINATION

101 Bachelor of Engineering

Sub. Name: Control Engineering

Sub. Code: 66241/80753/81007

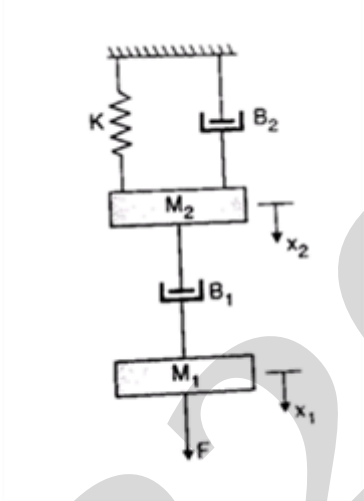
Day and Date: MAY ,05-05-2025 **Total Marks: 70**

Time: 02:30 PM To 05:00 PM

Instructions: **1. Assume suitable data wherever necessary and mention it boldly**
2. Draw neat labelled diagrams wherever necessary

Q1) Solve all from following questions **[10]**

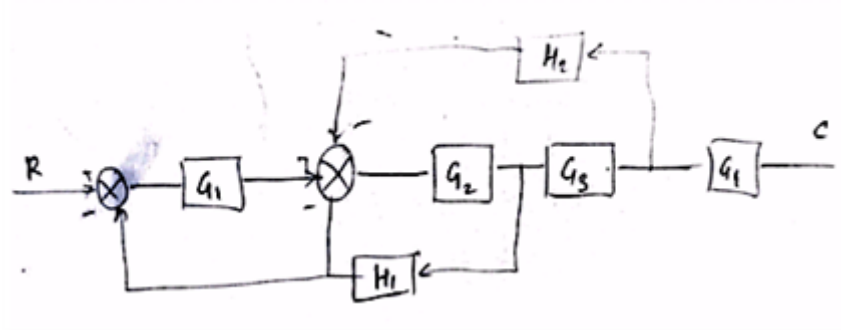
a. For the Mechanical system as shown in the figure, draw an equivalent circuit using a force-current analogy. Also, write the system equation. **[6]**



b. Write in details Mathematical model of Linear and Rotational system **[4]**

Q2) Question 'a' compulsery Solve any of from 'b' or 'c' **[12]**

a. Find the transfer function of the block diagram shown in fig. by Block diagram Reduction Technique **[6]**



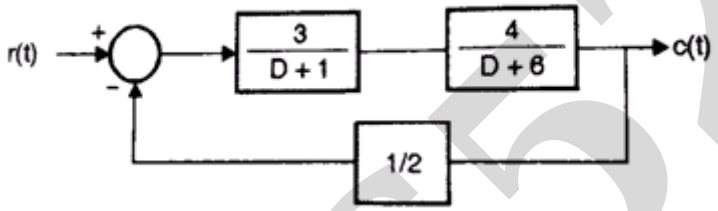
b. **[6]**

Head loss for liquid flowing through pipe is given by H= $\frac{4fLV^2}{2gD}$ where coefficient f and acceleration due to gravity g are constants. Determine the linear approximation for the head loss. For Vi=10, Di=20,

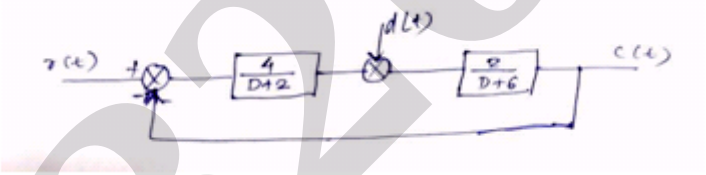
c. Linearise the equation $V = \frac{D}{T}$,where v is velocity D is displacement & T is time. Determine the linear approximation for 'v' due to chanfe in 'd' and change in 't' **[6]**

Q3) Solve any one from 'a','b' 'c' is compulsery from following questions [12]

a. A system for controlling the temp. of modern office building as shown in fig. Determine the response c(t) for following case - **r(t)=0 and C(0)= 1 , C'(0)=-2** **[6]**



b. A DC position control system is as shown in figure. Determine the response when r(t) = 5u(t), d(t)=0 **[6]**



c. If x is the input and y is the output of the system described by differential equation, **[6]**

$\frac{d^2y}{dt^2} + \frac{dy}{dt} + 8y = 8x$. Determine the natural frequency, damping ratio, damped natural frequency, peak overshoot and settling.

Q4) Solve all questions from following [12]

a. Sketch the root locus for the system **[8]**

$$G(S)H(S) = \frac{k}{s(s+1)(s+3)}$$

b. The linear feedback system has characteristic equation as s3 + 2 s2+ (k+1) s+ k=0 what is the value of k for system to be stable? **[4]**

Q5) Solve all questions from following [12]

a. For unity feedback control system G(s) = 100 / s(s+1) (s+5) sketch the bode plot. **[8]**

b. Define phase margin? What is phase and gain cross over frequency? **[4]**

Q6) Solve any two from following **[12]**

a. Determine state space representation and computer diagram by using series programing Method. **[6]**

$$y(t) = \frac{2\,(D+5)}{(D+2)(D+3)(D+4)}\,f(t)$$

b. Determine state space representation and computer diagram of the system given by the transfer function. **[6]**

$$Y(S) = \frac{2S+9}{S^3+8S^2+12\,S+10}\,U(S)$$

c. Determine state space representation and computer diagram for the system having transfer function by using series programming **[6]**

$$H(S) = \frac{7(S^2+3S+2)}{(S^2+8S+15)(S+7)}$$

End Of Question Paper

Important Note for Chief Exam Officer / SRPD Coordinator / Sr Supervisor/ Student -
This Question Paper may be distributed for following Subjects as common code.
सदरची प्रश्नपत्रिका खालील विषयांकरिता वितरित करता येईल.

1] (101) Bachelor of Engineering (81007) Control Engineering Part 3 SEM 5
2] (101) Bachelor of Engineering (66241) Control Engineering Part 3 SEM 5
3] (1154) B.Tech. CBCS (80753) Control Engineering Part 3 SEM 5