

Reg. No: 

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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech III Year I Semester Supplementary Examinations Feb-2021**

**LINEAR CONTROL SYSTEMS**

**(Electrical and Electronics Engineering)**

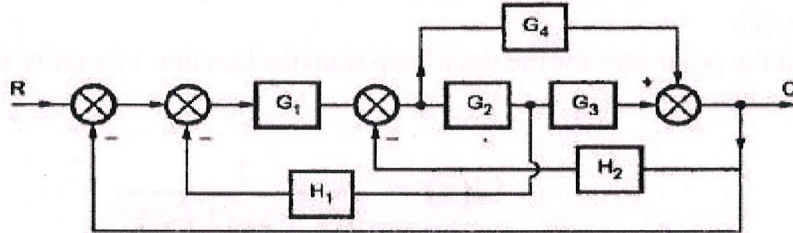
Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

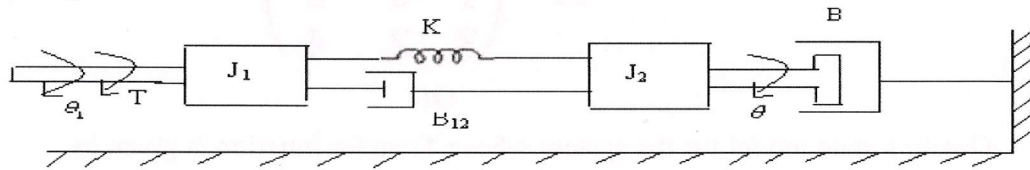
- 1 a Using Block diagram reduction technique find the Transfer Function of the system 8M



- b Distinguish between Block diagram Reduction Technique and Signal Flow Graph? 4M

**OR**

- 2 a Derive the transfer function for synchro with neat diagram? 4M  
b Write the differential equations governing the mechanical rotational system shown in the figure and find transfer function. 8M



**UNIT-II**

- 3 List out the time domain specifications and derive the expressions for Rise time, Peak time and Peak overshoot. 12M

**OR**

- 4 For servo mechanisms with open loop transfer function given below what type of input signal give rise to a constant steady state error and calculate their values. 12M

$$G(s)H(s) = \frac{10}{s^2(s+1)(s+2)}$$

**UNIT-III**

- 5 a With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equations: 6M

$$s^6 + 2s^5 + 8s^4 + 12s^3 + 20s^2 + 16s + 16 = 0.$$

- b Using Routh's criteria determine the stability for open loop transfer function has poles at  $s = 0$ ,  $s = -1$ ,  $s = -3$  and zeros at  $s = -5$ , Gain k of forward path is "10". 6M

**OR**

- 6 Sketch the root locus of the system whose open loop transfer function is 12M

$$G(s) H(s) = \frac{K}{s(s+4)(s^2+4s+20)}$$

UNIT-IV

- 7 a Band width is directly proportional to  $\omega_n$ . Justify. 4M  
 b Draw the Bode plot for the system having the following transfer function 8M

$$G(s) = \frac{15(s+5)}{s(s^2+16s+100)}$$

OR

- 8 a Given  $\xi = 0.7$  and  $\omega_n = 10$  rad/sec. Find resonant peak, resonant frequency and bandwidth. 6M  
 b Sketch the polar plot for the open loop transfer function of a unity feedback system is given by 6M

$$G(s) = \frac{1}{s(1+s)(1+2s)}$$

Determine Phase margin and gain margin.

UNIT-V

- 9 a State the properties of state transition matrix 6M  
 b Diagonalize the following system matrix 6M

$$A = \begin{pmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{pmatrix}$$

OR

- 10 Obtain a state model for the system whose Transfer function is given by 12M

$$\frac{Y(s)}{U(s)} = \frac{(7s^2+12s+8)}{(s^3+6s^2+11s+9)}$$

\*\*\* END \*\*\*