EXTC
SE sem IV CBGS
Control system

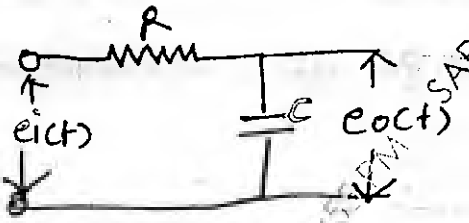
EXTC 22/12/15

QP Code : 5535

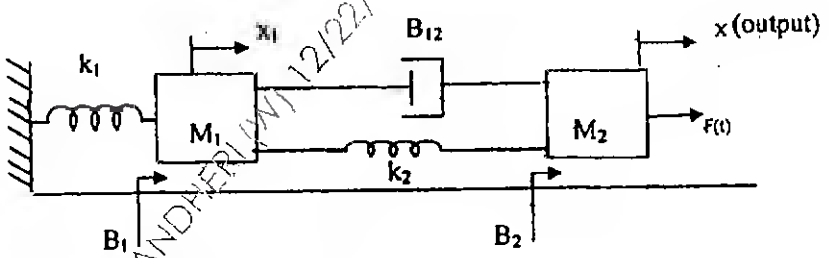
(3 Hours) [Total Marks :80

N.B. : (1) Question **No.1** is **compulsory**
(2) Attempt any **three** questions out of the remaining questions.
(3) Assume **data** whenever **necessary.**
(4) **Figures** to the **right** indicate **full** marks.

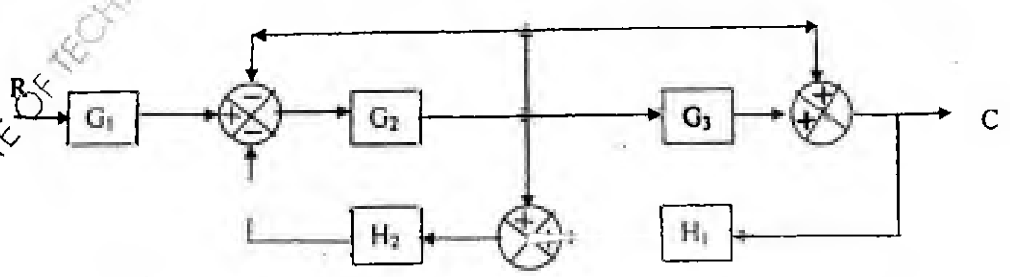
1. (a) Define rise time. 5
(b) Define gain margin and phase margin. 5
(c) What are the difficulities encountered in applying Routh stability criterion? 5
(d) Find out response of give system for a unit step I/P 5



2. (a) Obtain the transfer function of the mechanical systems shown in Fig. 11a (i). 10



(b) Draw a signal flow graph for the system shown in fig 11a (ii) and hence obtain the transfer function using Mason's gain formula. 10



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3. (a) Derive the expression for step response of second-order under damped system. 10

(b) Find the impulse response of the second order system whose transfer function 10

$$G(s)=\frac{9}{(s^2+4s+9)}$$

4. (a) A unity feedback system is characterized by an open loop transfer function 10

$G(s)=\frac{K}{s(s+10)}$ Determine the gain K so that the system will have a damping ratio of 0.5. For this value of K determine settling time peak over shoot and time to peak over shoot for a unit step input.

(b) An unity feedback system is given as $G(s)=\frac{1}{s(s+1)}$. The input to the 10

system is described by $r(t) = 4 + 6t + 2t^2$. Find the generalized error coefficients and the steady state error.

5. (a) Sketch the Bedplate showing the magnitude in dB and phase angle in degrees as a function of log frequency for the transfer function given by 10

$$G(s)=\frac{10}{s(1+0.5s)(1+0.1s)}$$ and hence determine the gain margin and the phase margin of the system.

(b) Sketch the root locus for a unity feedback system with open loop transfer function $G(s)=\frac{K}{s(s^2+8s+32)}$. 10

6. (a) Using Routh-Hurwitz criterion for the unity feedback system with open loop transfer function $G(s)=\frac{K}{s(s+1)(s+2)(s+5)}$ find 10

(i) the range of k for stability
(ii) the value of k for marginally stable
(iii) the actual location of the closed loop poles when the system is marginally stable.

(b) Explain controllably and observably. 10
