B.Tech III Year I Semester (R09) Supplementary Examinations June 2017

CONTROL SYSTEMS

(Common to EEE, ECE, E.con.E, EIE & MCT)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions

All questions carry equal marks

(Polar graph may be issued)

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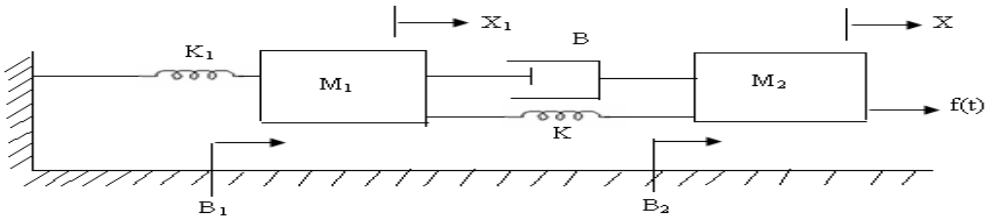
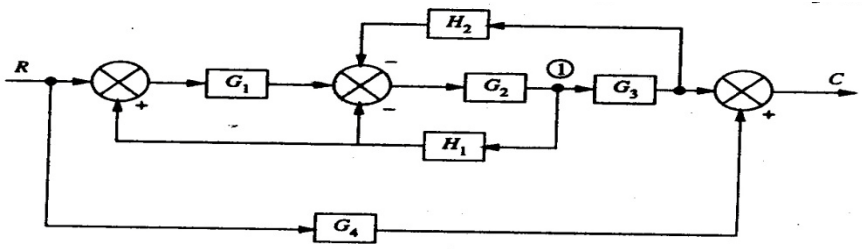
1 (a) Explain the basic components of control systems.

(b) Write the differential equations governing the mechanical system shown in the figure and determine the transfer function.



2 Find the transfer function shown in figure using block diagram algebra. [14M]



3 (a) Derive the transfer function for second order system subjected to a unit impulse input and draw the characteristics.

(b) Consider a unity feedback system with a closed loop transfer function $\frac{C(s)}{R(s)} = \frac{K_s+b}{s^2+as+b}$. Determine the open loop transfer function.

4 Sketch the root locus for the unity feedback system whose open loop transfer function is:

$G(s)=K/s(s^2+6s+10)$

5 (a) Find resonant peak and resonant frequency for the given damping ratio = 0.5. If the damping ratio is changed to 0.9, find the resonant peak and resonant frequency.

(b) Sketch the Bode Magnitude plot for the transfer function given by G(s)H(s)=2/[s(s+1)(1+0.2s)].

6 Determine the stability of the system using Nyquist stability criterion:

G(s)H(s) = 10/[s(s+1)(s+4)]

7 Consider a unity feedback system with open loop transfer function, G(s)=20/s(s+2)(S+4). Design a PD controller so that the damping ratio of 0.8 and natural frequency of oscillations as 2 rad/sec.

8 (a) State the properties of STM.

(b) Diagonalize the following system matrix $A = \begin{bmatrix} 0 & 6 & -5 \\ 1 & 0 & 2 \\ 3 & 2 & 4 \end{bmatrix}$.

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