Code No: R22026 **R10** SET - 1

II B. Tech II Semester Supplementary Examinations, April/May-2017
CONTROL SYSTEMS
(Com. to EEE, ECE, EIE, ECC, AE)

Time: 3 hours Max. Marks: 75

Answer any **FIVE** Questions
All Questions carry **Equal** Marks
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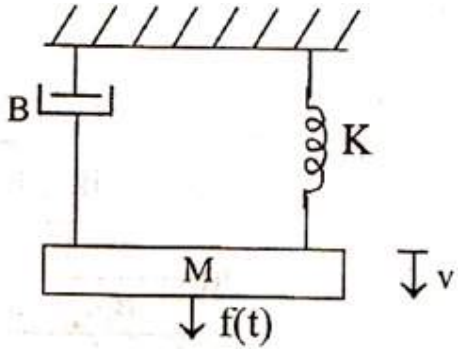
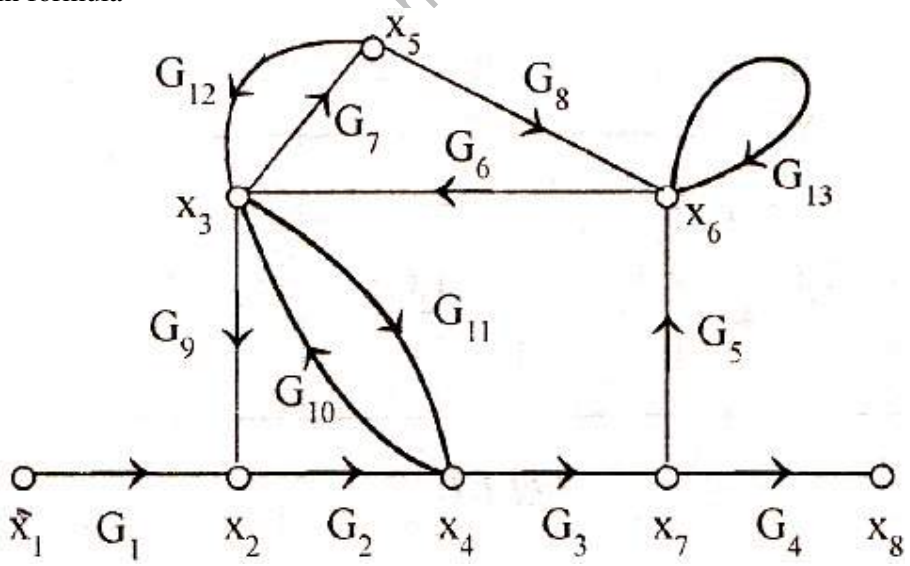
1. a) What is control system? Write advantages and disadvantages of open loop and closed loop control system (8M)
   b) Determine the transfer function $\frac{V(s)}{F(s)}$, for the system show in below figure (7M)



2. a) Derive the transfer function of Synchronous transmitter (6M)
   b) Find the transfer function for control function shown below figure using Mason's gain formula (9M)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3. a) The closed loop transfer function of unity feedback control system is given by $\frac{C(s)}{R(s)}=\frac{5}{s^2+4s+5}$. Find Damping ratio, natural undamped response frequency, percentage peak overshoot. (8M)

   b) Determine the error co-efficient and static error for unity and non-unity system $G(s)=\frac{1}{s(s+1)(s+10)}$, $H(s)=s+2$ (7M)

4. a) A unity feedback system has the following open-loop transfer function $G(s)=\frac{K}{(s+2)(s+4)(s^2+6s+25)}$ Discuss the stability of the closed-loop system in term of parameter K. Determine the value of K which will cause sustained oscillations in the closed loop system (6M)

   b) Plot the root locus pattern of a system whose forward path transfer function is $G(s)=\frac{K(s+1)}{s^2(s+2)}$ (9M)

5. a) The closed loop transfer function of feedback system is given by $T(s)=\frac{1000}{(s+22.5)(s^2+2.45s+44.4)}$. Determine the resonant peak M_r, and resonant frequency of the system (7M)

   b) Draw the bode plot of unity feedback system having $G(s)=\frac{10}{s(1+0.01s)(1+0.1s)}$. Determine phase margin and gain margin (8M)

6. a) Sketch the polar plot for $G(s)=\frac{1}{(1+sT1)(1+sT2)}$. (5M)

   b) Construct the Nyquist plot for a system whose open loop transfer function is given by $G(s)H(s)=\frac{K(1+s)^2}{s^3}$. Find the range of K for stability (10M)

7. a) Write the effect and limitation of phase-lag controller (5M)

   b) Explain the design of Lead-Lag controller (10M)

8. a) State and prove the properties of state transition matrix (8M)

   b) Transfer function of a system is given by $\frac{Y(s)}{U(s)}=\frac{2}{s^3+6s^2+11s+6}$. find controllability and observability (7M)