SE Sem- IV (CBGS)(Electronics): Principles of control sys. 15/12/1

QP CODE : 548103

(3 Hours) **[Total Marks : 80**

NB:-

a) Question number 1 is compulsory.

b) Attempt any three questions out of remaining questions.

c) Assume suitable data wherever necessary.

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1. Attempt following questions; **20**

a) Compare Open loop control system with closed loop control system.

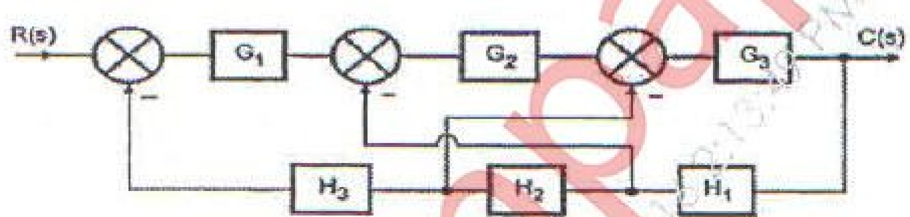
b) Explain the methods to determine the stability of system.

c) How to find GM and PM from Bode plot.

d) Explain Lag-Lead Compensation.

2. a) Explain and derive the rules for reduction of block diagram in control system. **10**

b) Determine the transfer function of the control system represented by following block diagram **10**



3. a) The open loop transfer function of a unity feedback system is given by **10**

$$G(s) = \frac{K(s+1)}{s(s+2)(s+3)}$$

Sketch the root locus and find the range of values of K for the system to be stable

b) Explain the rules to construct the root locus. **10**

4. a) Examine the observability of the system given below. **10**

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u = Ax+Bu$$

b) Derive the time response expression for second order underdamped control system for unit step input. **10**

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5. a) Sketch the Bode Plot for the open loop transfer function given by 10

$$G(s) = \frac{4(s+5)(s+10)}{s^2(s+20)}$$

b) Explain the correlations between time and frequency domain specifications of the system. 10

6. a) Find polar plot for the transfer function given below 10

$$G(s) = \frac{12}{s(s+1)}$$

b) A system is represented by the state equation 10

$$\dot{x(t)} = \begin{bmatrix} 0 & 1 \\ -4 & -5 \end{bmatrix} x(t) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

Find the State transition matrix.

Course: S.E. (Sem IV) (CBSGS) (All Branch)

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Question No. 4 a

Please read it as follows:

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \\ \dot{x}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u = Ax + Bu$$

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