Total No. of Questions : 5] *[Total No. of Printed Pages : 2*

Roll No.....

EI/IC-605

B.E. VI Semester

Examination, June 2016

Control Systems

Time : Three Hours

Maximum Marks : 70

Note: Total number of questions five. Attempt all questions.

1. a) Give the detailed classification of control system.
   b) What is signal flow graph? Draw the signal flow graph and explain its basic terminology?

OR

   a) What are the various pneumatic devices used for control purposes.
   b) What is meant by servomechanism? Explain with necessary diagrams.

2. The unity feedback system is characterized by an open loop transfer function is G(s) = 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 overshoot and time to Peak overshoot for a unit-step input.

OR

   a) Define steady state error constants. For a servomechanisms with open loop transfer function G(s) = 10/(s + 2) (s + 3). What type of input signal gives constant steady state error and calculate its value.
   b) Discuss various feedback characteristics.

3. Show that a part of root locus of a system with $G(s)=\frac{K(s+3)}{s(s+2)}$ is circular. Find the minimum value of damping ration and corresponding value of 'K' and the poles corresponding to this value of K. Also find the range of 'K' for the system to be
   i) Overdamped ii) Critically damped and
   iii) Underdamped

OR

   a) What the various frequency domain specifications? Develop the correlation between time and frequency domain specifications.
   b) Discuss how Bode plots are useful in determination of transfer function from the experimental data.

4. a) Derive relationship between transfer function and state space model.
   b) Consider a system described by

$$\dot{X}=\begin{bmatrix}0 & 2\\ -3 & -5\end{bmatrix}X+\begin{bmatrix}0\\ 1\end{bmatrix}u \text{ and } y=\begin{bmatrix}1 & -1\end{bmatrix}X$$

   If the initial state vector is $X(0)=\begin{bmatrix}1 & -1\end{bmatrix}^T$, find the zero input response.

OR

   a) A feedback system has a closed-loop transfer function:

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

   Construct any two state model of the system.
   b) Explain the importance of controllability and observability of the control system model in the design of the control system.

5. Write technical notes on any two:
   a) Simulink
   b) MATLAB
   c) Root sensitivity
   d) Design of compensation
   e) Control modes

******