Code No: 55012 **R09**

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year I Semester Examinations, November - 2015**

**CONTROL SYSTEMS**

**(Common to EEE, ECE, ETM)**

**Time: 3 hours** **Max. Marks: 75**

**Answer any five questions**

**All questions carry equal marks**

\- - -

1.a) What do you mean by feedback ? Why negative feedback is preferred in control systems over positive feedback?

b) Briefly explain the classification of control systems. [7+8]

2.a) Derive the transfer function of Armature controlled DC servo motor.

b) State and explain Mason's gain formula. [7+8]

3.a) A unity feedback system is characterized by the open loop transfer function;

$$\frac{1}{s(0.5s+1)(0.2s+1)}$$

Determine the study state error for unit step, unit ramp and unit acceleration input.

b) Explain effects of proportional derivative and proportional integral controllers in system performance. [7+8]

4.a) Sketch root locus diagram and find brake in and brake away points for the following system.

$$G(S)\,H(S)=\frac{k}{S(S+4)}$$

b) For the above system find the value of k at s=-2 and s=-2+2j. [7+8]

5.a) The open loop Transfer function of a unit feedback control system is given as $G(S)=\frac{as+1}{s^2}$ find the value of "a" which gives a phase margin of $45^0$ ?

b) The system transfer function is given by $\frac{10}{(s+2)}$. Find study state output for the input $2\cos(2t+15^0)$ ? [7+8]

6.a) Sketch the Nyquist plot for the system $G(S)H(S)=\frac{k}{s\left(1+sT_1(1+sT_2)\right)}$.

b) Explain Nyquist plot stability criteria. [7+8]

7.a) When compensation is required in control design techniques? How is a compensator selected? Explain briefly.

b) What is lead compensator? When it is preferred? [7+8]

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

b) Find out state transition matrix of the following system.

$$X(t)=\begin{bmatrix}0 & 1\\ 0 & -3\end{bmatrix}x(t)+\begin{bmatrix}1\\ 0\end{bmatrix}u(t)$$ [7+8]

---ooOoo---