MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY, JAMSHORO

FIRST TERM THIRD YEAR (5^{H} TERM) B.E (ELECTRONICS) REGULAR EXAMINATIONTION 2006 OF 04 BATCHES UNDER EXTERNAL SYSTEM.

Feedback Control Systems

Dated: Time Allowed: 03 Hours Max: Marks-80

NOTE: *Attempt any **five** questions. All questions carry equal marks.*

Q. No.01 **(a)** For the following transfer function **[08]**

$$G(S) = \frac{100(S+1)}{S(S+5)(S+7)}$$

Obtain
i) poles
ii) zeros
iii) pole-zero map in s-plane

(b) What is feedback and what is its effect on the **[08]**
i) Sensitivity
ii) Bandwidth
iii) Stability

Q. No.02 **(a)** Draw the step response of a second order system for each of the following case. **[08]**
i) $\zeta=0$
ii) $0<\zeta<1$
iii) $\zeta=1$
iv) $\zeta>1$

(b) Explain in detail the operation of electronic pacemaker. **[08]**

Q. No.03 The open loop transfer function of a unity feedback system is given beloalculate the steady state error for step, ramp and parabolic inputs. **[16]**

$$G(S) = \frac{100(S+1)}{S(S+5)(S+7)}$$

Q. No.04 For the following transfer function obtain the state space representation and also draw the simulation diagram. **[16]**

$$\frac{C(S)}{R(S)} = \frac{S+2}{S^2+7S+12}$$

Q.No.05 For the system given below obtain the controllability and Observability matrix and check the state controllability and state controllability of the system. **[16]**

$$A = \begin{pmatrix} -1 & 0 & 0 \\ 0 & -2 & -3 \\ 0 & 0 & 3 \end{pmatrix} \qquad B = \begin{pmatrix} 3 \\ -6 \\ 3 \end{pmatrix}$$

$$C = [\,1 \quad 1 \quad 0\,] \qquad D=0$$

Q.No.06 **(a)** Use the Routh Herwitz criterion to find how many poles of the following closed system T(S) are in L.H.P, in R.H.P and on jω axis. **[10]**

$$T(S) = \frac{S^3+7S^2-21S+10}{S^6+S^5-6S^4-S^2-S+6}$$

(b) Explain the absolute stability and relative stability of the system. **[06]**

Q.No.07 Use Nyquist stability criteria to determine the value of K to confirm the stability of the system given below. **[16]**

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

Q.No.08 The open loop transfer function of a unity feedback system is given by **[16]**

$$G(S) = \frac{K}{S(S+2)(S+4)}$$

Draw bode diagram for K=1.