**Control system**

**Assignment :-3 Unit three**

1. What are the necessary but not sufficient conditions for a system to be stable?
2. Investigate the stability by Routh-Hurwitz criterion of the system whose characteristic equation are
   1. s5+s4+2s3+2s2+3s+5=0
   2. s6+3s5+4s4+5s3+5s2+3s+2=0
3. The open loop transfer function of a feedback control system is given by . Determine the parameters K and T for which the closed loop system is stable.
4. The open loop transfer function of a unity feedback control system is given as . It is desired that all the roots of the characteristics equation must lie in the region to the left of the line s=-a. Determine the values of K and T required so that there are no roots to right of the line s =-a.
5. The open loop transfer function of a ufb system is given by . Determine the values of K that will cause sustained oscillation in the closed loop system. Also, find the oscillation frequency.
6. For a ufb system the open loop transfer function is given by .
   1. Sketch the root locus for.
   2. At what value of ‘K’ the system becomes unstable
   3. At this point of instability determine the frequency of oscillation of the system.
7. Sketch the root loci for, H(s)=1.
8. A ufb system has an open loop transfer function. Sketch the root locus plot with K as variable parameter and show that the loci of complex roots are part of a circle with (-1, 0) as centre and radius.

**Answers:**

1. Theory
2. Answers are
   1. Unstable because 2 roots on RHS of s plane
   2. Unstable because roots are +-j, +-j, -1, -2 (multiple), Note: Here we have two vanishing rows
3. K>1, T>2.
4. K>a(1-aT), if aT=0 then K>a and if at=1/2 then K>a/2
5. 39/16>K>0, wn=0.75 rad/sec

**Refer Books**

1. Problems & Sol of Control System by A.K. Jairath, CBS Publication.
2. Automatic Control System by Hasan Saeed, Kataria Publication