M.E.(EE) 2nd Semester Examination,2012

Dynamics of Regulated Machines

(EE-1010)

Time : 3 hours **Full Marks:70**

Answer any Five questions

1. (a) Briefly describe the quality of a regulating system. [4]
   (b) Derive the dynamic model of automatic regulation of the dc motor speed by variation of its armature. [10]
2. (a) What do you mean by automatic regulating system? Explain with suitable example. [4]
   (b) State the advantages of state space model over transfer function model. [4]
   (c) Develop the state feed back model of dc motor drives. [6]
3. (a)What are the implications of right and left eigenvectors on system small perturbation state of any regulated machine? Explain analytically. [14]
4. Analytically establish the effect of the exciter on the dynamics of an alternator following a small disturbance. [14]
5. (a) Find the overall transfer function of an Amplidyne and an armature controlled d.c motor with field excitation current kept constant.
   (b) Explain the working principle of the automatic regulating system for the d.c generator voltage and draw the network configuration of the voltage regulating system. [8+6]
6. (a) Explain with diagram in detail and develop the equations of the individual elements to draw the structural diagram of the speed regulating system of a d.c motor. The parameters of the individual links have the following values.

   T_1=0.15 sec T_2=0.1 sec
   T_3= 0.5 sec T_4=0.01 sec

   The overall gain of the system K_{av}=800.

   Show that if a stabilizing device in the form of RC circuit is introduced into the system, the system will remain stable for an infinite increase of its gain with τ=0.01 and $K_3K_4K_5$=100. [7+7]
7. In the structural diagram of a closed loop automatic control system, the basic elements are represented by three series connected aperiodic links. The data of the individual links is as follows:

   T_1= 0.01 K_1=40
   T_2= 0.34 K_2=1
   T_3=0.1 K_3=15

   Check the stability of the system.
   A flexible negative feedback network having a transfer function of the type $\tau P/(1+\tau P)$ be connected in two different ways
   (a) When the stabilizing feedback network encloses the first two links.
   (b) When the stabilizing feedback network encloses only the first link.
   Check the stability of the system in both the cases with τ=0.5. [7+7]