Code: R7420202

R7

B.Tech IV Year II Semester (R07) Advanced Supplementary Examinations June 2012

ADVANCED CONTROL SYSTEMS

(Electrical and Electronics Engineering)

Time: 3 hours Max Marks: 80

Answer any FIVE questions

All questions carry equal marks

*****

1 A feedback system is characterized by the closed loop transfer function: T(s) = $\frac{s^2+3s+3}{s^3+2s^2+3s+1}$. Construct a state model for the T(s) and also give the block diagram representation for the same.

2 (a) What is duality property? State and prove principle of duality.
(b) Explain how linear time invariant system transform into controllable canonical form.

3 What is dead-zone? Derive the describing function of dead-zone nonlinearity.

4 A linear second order servo is described by the equation $\ddot{e}+2\xi w_n \dot{e} + w_n^r e = 0$, where ξ = 0.15, w_n = 1 rad/sec, e (0) = 1.5 and e (0) = 0. Determine the singular point. Construct the phase trajectory, using the method of isoclines.

5 Determine the stability of the system described by the equation: $\dot{X} = A \cdot X$. where, $A=\begin{bmatrix}-1 & -2\\ 1 & -4\end{bmatrix}$ using lypunov's direct method.

6 (a) Explain the different methods of determination of observer gain matrix.
(b) Consider the system described by the state model $\dot{X} = A \cdot x$. Where $A=\begin{bmatrix}-1 & 1\\ 1 & -2\end{bmatrix}$ and Y = cx, c= [1 0] obtain the state observer gain matrix. The desired given values for the observer matrix are: μ_1= -5, μ_2 = -5·.

7 (a) Derive 'Euler-lagrangine' equation.
(b) Discuss the application of euler-lagrangine equation.

8 (a) Explain minimum time problem.
(b) Explain output regulator problem.

*****