

III B.Tech II Semester Supplementary Examinations, April/May 2005
ADVANCED CONTROL SYSTEMS
(Electronics & Control Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE Questions
 All Questions carry equal marks

1. Define Minimum energy control. State the theorem and prove the same.
2. For the system $\dot{x} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} x$ find a suitable Lyapunov function $V(x)$. Find an upper bound on time that it takes the system to get from the initial condition $x(0) = \begin{bmatrix} 1 \\ 1 \end{bmatrix}$ to within the area defined by $x_1^2 + x_2^2 = 0.1$.

3. (a) Consider the system of

$$A = \begin{bmatrix} 0 & 1 & 0 \\ 3 & 2 & 0 \\ 1 & 1 & 1 \end{bmatrix} \quad B = \begin{bmatrix} 0 & 0 \\ 1 & 0 \\ 0 & 1 \end{bmatrix} \quad \text{and} \quad C = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

For this system, design an observer of order one. The observer pole is required to be located at -4.

- (b) With a neat sketch explain a full order state observer
4. (a) Explain Tracking Problem?
 (b) Explain Minimum fuel Problem?
5. Illustrate with an example the problem with terminal time t_1 and $x(t_1)$ free.
6. Express the following $T(s)$ given below as $P_0^{-1}(s)Q_0(s)$, with $P_0(s)$ and $Q_0(s)$ relatively left prime and $P_0(s)$ row proper. Find the minimal realization. Determine the values of the controllability index and observability index for the minimal realization.
7. Write the MATLAB commands for drawing root locus for the following system with,

$$G(s)H(s) = \frac{K}{(s+1)(s+3)(s+4)}$$

8. (a) How do you perform the following operations using MATLAB ?
 - i. To find eigen values
 - ii. Matrix multiplication
 Illustrate with examples.
- (b) Write short notes on:
 - i. Relational and logic operations
 - ii. Matrices operations and functions using MATLAB techniques
