Roll No .....

EX - 8403

B.E. VIII Semester

Examination, June 2015

Advanced Control System

(Elective-IV)

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt one question from each unit.
ii) All questions carry equal marks.

Unit - I

1. Develop state model in cascade form for the transfer function given below: 14

$$\frac{Y(s)}{U(s)} = \frac{1}{(s+5)(s+4)}$$

Determine the feedback gain matrix for the application of state variable feedback such that the poles are located at $S = (-1 \pm j_2)$.

OR

2. For a certain control system.

$$G(s)H(s) = \frac{k}{s(s+2)(s+10)}$$

Sketch the Nyquist plot and hence calculate the range of values of k for stability. 14

Unit - II

3. Obtain the state space representation for the transfer function given below: 14

$$\frac{Y(s)}{U(s)} = \frac{2}{s^3 + 2s^2 + 3s + 4}$$

i) Controllable canonical form.
ii) Observable canonical form.

OR

4. Write a short note on the followings:
   a) Concepts of state variables. 7
   b) State variable feedback as applied to pole placement. 7

Unit - III

5. a) Distinguish between conventional control theory and modern control theory. 7
   b) Write a short note on advantages and limitations of variable structure control. 7

OR

6. Write a short note on salient feature of variable structure control. Explain with examples. 14

Unit - IV

7. Determine the Lyapunov function and comment on the stability of the system given as. 14

$$\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -x_1^2 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$$

OR

8. a) Show that the system described below is unstable

$$\dot{x} = \begin{bmatrix} 0 & 1 \\ 3 & -2 \end{bmatrix} x$$

Verify the result using Lyapunov method. 7
   b) Write a short note on phase plane technique. 7

Unit - V

9. Explain the followings:
   a) Pontryagin's maximum principle. 7
   b) Transversality condition. 7

OR

10. Write a short notes on the followings:
   a) Calculus of variation 7
   b) Bolza problem. 7

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