Total No. of Questions : 8] *[Total No. of Printed Pages : 2*

Roll No .....

EX-8403

B.E. VIII Semester

Examination, June 2017

Advanced Control System

(Elective - IV)

Time : Three Hours

Maximum Marks : 70

Note: i) Answer any five questions.
ii) All questions carry equal marks.

1. An open loop system with the transfer function

$$G(s)H(s) = \frac{s+1}{s^2(s-2)}$$

Determine the stability by Nyquist criteria when the feedback path is closed.

2. The transfer function for the system is given as

$$\frac{Y(s)}{U(s)} = \frac{2}{s^3+5s^2+10s+8}$$

Find the controlability and observability.

3. The equation of motion of an undamped oscillator with frequency ω_0 is

$\ddot{y} + \omega_0^2 y = u$

Find k_1 and k_2 such that $u = -k_1x_1 - k_2x_2$ gives closed loop poles with $\omega_n = 2\omega_0$ and $\zeta = 1$.

4. A system has transfer function $\frac{Y(s)}{U(s)} = \frac{9}{s^2-9}$. Compute K so that the control law u = – KX places the closed loop poles at $-3 \pm j3$.

5. Write a short note on advantages and limitations of variable structure control.

6. What are the salient features of VSC? Explain with examples.

7. The dynamics of a control system is represented by :

$$\dot{x}_1 = x_2 - x_1\left(x_1^2 + x_2^2\right) \; ; \; \dot{x}_2 = -x_1 - x_2\left(x_1^2 + x_2^2\right)$$

Determine the system stability using Lyapunov method.

8. Answer any four of the following:
   a) An n^{th} order state variable model in Jordan canonical form always yields n decoupled first order differential equations. Is the statement true? Justify your answer.
   b) Briefly describe the configuration of a state feedback control system.
   c) Explain the theorem "Region of attraction" of variable structure control.
   d) Explain phase plane technique of analysing the non-linear control system.
   e) Give statement of a time optimal control system.
   f) What is meant by performance index of an optimal control system?

******