Question Paper Code: 35063

B.E. / B.Tech. DEGREE EXAMINATION, DEC 2020

Fifth Semester

Instrumentation and Control Engineering

01UIC503 – ADVANCED CONTROL SYSTEM

(Regulation 2013)

Duration: One hour   Maximum: 30 Marks

PART A - (6 x 1 = 6 Marks)

(Answer any six of the following questions)

1. The variable which determine the state of a dynamical system, are called

    (a) State-analysis   (b) State-vector
    (c) State-variables   (d) State-space

2. In a system, all initial states are controllable. The system is said to be

    (a) Partially controllable   (b) Uncontrollable
    (c) Infinity   (d) Completely controllable

3. The coordinate plane with the state variables x_1 and x_2 as two axes is called

    (a) phase trajectory   (b) phase portrait   (c) phase plane   (d) singular point

4. Non linear systems often have_____ steady-state solutions.

    (a) Single   (b) Multiple   (c) One or Two   (d) Zero

5. In many cases the system presents a nonlinear phenomenon which is fully characterized by its _____ characteristics.

    (a) Dynamic   (b) First order   (c) Static   (d) Second order

6. A locus passing through the points of same slope in phase plane is called

    (a) limit cycles   (b) phase portrait   (c) phase plane   (d) isoclines

7. The system describe by $\dot{x}(t) = F(x(t))$, a state $x_e(t)$ where $F(x_e(t)) = 0$; for all t is called as a/ an _____ of the system.

   (a) Un stable   (b) Stable

   (c) Equilibrium state   (d) Un stable equilibrium state

8. In the following equations, which one is named as negative – definite scalar function based on Liapunov's stability criterion?

   (a) $\dfrac{dV(x)}{dt}$ (b) $\dfrac{dV^2(x)}{dt^3}$ (c) $dV(x)$ (d) $\dfrac{dV}{dt}$

9. A control system is optimum when the selected performance index is

   (a) Maximized   (b) Controlled

   (c) Non controlled   (d) Minimized

10. The optimal control theory is applicable for

   (a) Multivariable system   (b) SISO

   (c) Autonomous system   (d) None of these

PART – B (3 x 8= 24 Marks)

(Answer any three of the following questions)

11. Obtain the three canonical state model of the system whose transfer function is given as $\dfrac{Y(s)}{U(s)} = \dfrac{10}{s^3+4s^2+2s+1}$ (8)

12. Draw and explain the construction of phase trajectories by using delta method. (8)

13. The response of a system is $y = ax + b\dfrac{dx}{dt}$ test whether the system is linear or nonlinear. (8)

14. Consider the dynamics of the system represented by $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -1 & -1 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ Formulate the liapunov function to test the asymptotic stability of the system. (8)

15. A first-order system is described by the differential equation $\dot{x}(t) = 2x(t) + u(t)$ It is desired to find the control law that minimizes the performance index. (8)

2

35063