MANMOHAN TECHNICAL UNIVERSITY

SCHOOL OF ENGINEERING

MODEL Questions (2081)

CONTROL SYSTEM ENGINEERING (EG554EE)

BEEE (II/II)

FM: 50

PM: 20

MCQ (10×1=10) Attempt all the questions.

1. Which of the following is not a closed loop control system?
   a) Air Conditioner b) Turbine-Governor System
   a) Switch and Light System d) Microwave Oven
2. The closed loop transfer function of a system which has forward path G and a negative feedback H is expressed as:
   a) $\frac{1}{1+GH}$ b) $\frac{G}{1+GH}$ c) $\frac{1}{1-GH}$ d) $\frac{G}{1-GH}$
3. The no. of poles in Right Hand of S-plane for a Transfer Function G(s) = $\frac{s^2-3s+4}{s^3+3s^2+2s}$ is
   a) 0 b) 1 c) 2 d) 3
4. The settling time of a second order system excited with unit step input is:
   a) $\frac{\pi}{\omega_d}$ b) $\frac{1}{\xi\omega_n}$ c) $\frac{4}{\xi\omega_n}$ d) $\frac{\pi-\theta}{\omega_d}$
5. Find the value of 'K' for which a system characterized by $4s^3+2s^2+3s+K=0$ is stable.
   a) K > 0 b) K > 1/2 c) K < 3/2 d) K > 3/2
6. The steady state error of a closed loop control system can be calculated as:
   a) $e_{ss}=\lim_{t\to 0} e(t)$ b) $e_{ss}=\lim_{t\to\infty} te(t)$ c) $e_{ss}=\lim_{s\to\infty}\frac{s\,R(s)}{1+G(s)H(s)}$
   d) $e_{ss}=\lim_{s\to 0}\frac{s\,R(s)}{1+G(s)H(s)}$
7. The roots of quadratic equation $s^2-3s+4=0$ are:
   a) Real and equal b) Real but unequal c) Complex and Conjugate
   b) Complex but not conjugate
8. The Integral component of a PID Controller improves the …….. of a control system.
   a) Stability b) Bandwidth c) Damping d) Faster Response
9. The condition of second order system excited with unit step input is defined by $\xi=1$. The system is classified as:
   a) Undamped b) Underdamped c) Critically Damped d) Overdamped
10. An open loop transfer function has 3 poles and 2 zeros. While subjected to a unity-feedback, what will be the number of root locii?
    a) 1 b) 2 c) 3 d) 5

Sample Question

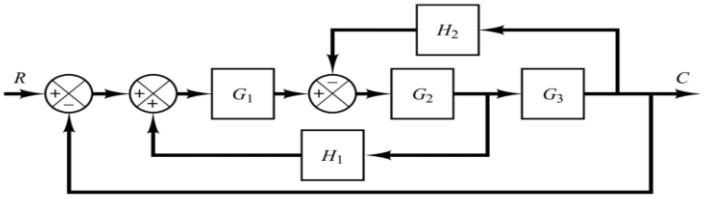
SQ (8×2=16) Attempt any EIGHT from nine questions.

1. Discuss about Mechatronic Systems with suitable examples.
2. Linearize the equation $Z = 3x^2 - 7xy + 9y^2$ inside the interval specified by $3<x<4$ and $-2<y<3$.
3. Derive the expression for Transfer Function of a closed loop control system with negative feedback.
4. Discuss the effect of feedback in the stability of a control system.
5. Compute the State Transition Matrix when $A = \begin{bmatrix} -1 & 1 \\ 0 & 2 \end{bmatrix}$.
6. The forward path of a unity feedback control system is represented by $G(s) = \frac{5(s^2+2s+100)}{s^2(s+5)(s^2+3s+10)}$. Determine the type of the system and acceleration error constant (k_a).
7. Examine the stability of the system whose characteristic equation is given by $s^4+2s^3+3s^2+4s+5=0$.
8. Sketch the polar plot for $G(s) = \frac{10}{s(s+1)}$.
9. Discuss the advantages of PID controller in control systems.

Sample Question

LQ (6×4=24) Attempt any SIX from seven questions.

10. Find the overall transfer function C(s) / R(s) from the following block diagram.



11. Construct the state space model of a system characterized by the differential equation:
$$y''' + 6y'' + 11y' + 6y = u$$
12. Derive the expression for output c(t) for a second order system excited with unit step input.
13. The Forward Path Transfer Function of a Unity Feedback Control System is given by $G(s) = \frac{k}{s(s+4)(s+5)}$. Sketch the root locus as K varies from zero to infinity.
14. Draw the Bode Plot Diagram for the Transfer Function: $G(s) = \frac{800}{s(s+2)(s+20)}$.
15. Derive the expression for Transfer Function of Phase Lead Network used for compensation in control systems.
16. When a second order control system is subjected to a unit step input, the values of $\xi = 0.5$ and $\omega_n = 6$ rad/sec. Determine rise time and maximum overshoot.

ALL THE BEST