Control System Questions

Multiple Choice Questions (MCQ)

March 4, 2022

1. The term 'reset control' refers to:

   (A) Integral control
   (B) Derivative control
   (C) Proportional control
   (D) None of the above

   Solution: (A)

2. The transfer function $\frac{1+0.5s}{1+s}$ represent a:

   (A) Lag network
   (B) Lead network
   (C) Lag–lead network
   (D) Proportional controller

   Solution: (A)

3. While designing controller, the advantage of pole–zero cancellation is:

   (A) The system order is increased
   (B) The system order is reduced
   (C) The cost of controller becomes low
   (D) System's error reduced to optimum levels

   Solution: (B)

4. A proportional controller leads to:

   (A) infinite error for step input for type 1 system
   (B) finite error for step input for type 1 system
   (C) zero steady state error for step input for type 1 system
   (D) zero steady state error for step input for type 0 system

Solution: (C)

5. The state-space representation of a system is given by:
$\dot{\boldsymbol{x}} = \begin{bmatrix} -1 & 0 \\ 0 & -2 \end{bmatrix} x(t) + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(t), y(t) = \begin{bmatrix} 1 & 1 \end{bmatrix} x(t)$
The transfer function of this system is

(A) $(s^2 + 3s + 2)^{-1}$
(B) $(s + 2)^{-1}$
(C) $s(s^2 + 3s + 2)^{-1}$
(D) $(s + 1)^{-1}$

Solution: (D)
$T(s) = \begin{bmatrix} 1 \\ 1 \end{bmatrix} (s\boldsymbol{I} - \boldsymbol{A})^{-1} \begin{bmatrix} 1 \\ 0 \end{bmatrix}$
$(s\boldsymbol{I} - \boldsymbol{A})^{-1} = \begin{bmatrix} \frac{1}{s+1} & 0 \\ 0 & \frac{1}{s+2} \end{bmatrix}$
$T(s) = \begin{bmatrix} 1 \\ 1 \end{bmatrix} \begin{bmatrix} \frac{1}{s+1} & 0 \\ 0 & \frac{1}{s+2} \end{bmatrix} \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \frac{1}{s+1}$

6. A Lag network for compensation normally consists of:

(A) R, L and C elements
(B) R and L elements
(C) R and C elements
(D) R only

Solution: (C)

7. The phase margin of a system with the open loop transfer function:
$G(s)H(s) = \dfrac{(1-s)}{(1+s)(3+s)}$ is

(A) 68.3°
(B) 90°
(C) 0°
(D) ∞

Solution: (D)
$|GH(j\omega)| \neq 1$, for any value of ω. Thus phase margin is ∞

8. The correct sequence of steps needed to improve system stability is:

(A) reduce gain, use negative feedback, insert derivative action
(B) reduce gain, insert derivative action, use negative feedback
(C) insert derivative action, use negative feedback, reduce gain

(D) use negative feedback, reduce gain, insert derivative action

Solution: (D)

9. A lead compensating network

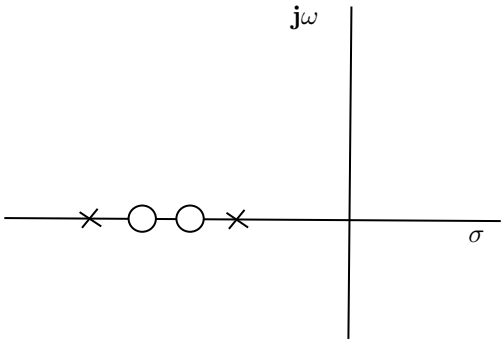
   (a) improves response time
   (b) stabilizes the system with low phase margin
   (c) enables moderate increase in gain without affecting stability
   (d) increases resonant frequency

   In the above statements, correct are:

   (A) (a) and (b)
   (B) (a) and (c)
   (C) (a), (c) and (d)
   (D) (a), (b), (c) & (d)

Solution: (D)

10. The pole–zero plot given in fig. is that of a:



   (A) PID controller
   (B) PD controller
   (C) Integrator
   (D) Lag–lead compensating network

Solution: (D)