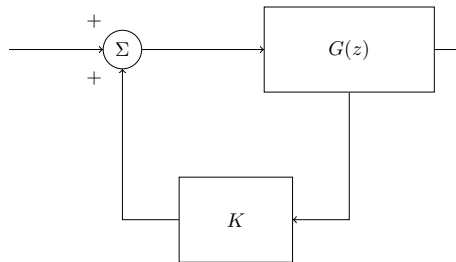


35) The system  $\frac{900}{(s(s+1)(s+9))}$  is to be compensated such that its gain-crossover frequency becomes same as its uncompensated phase-crossover frequency and provides a  $45^\circ$  phase margin. To achieve this, one may use

- a) A lag compensator that provides an attenuation of  $20dB$  and a phase lag of  $45^\circ$  at the frequency of  $3\sqrt{3}rad/s$
- b) A lead compensator that provides an amplification of  $20dB$  and a phase lead of  $45^\circ$  at the frequency of  $3rad/s$
- c) A lag-lead compensator that provides an amplification of  $20dB$  and a phase lag of  $45^\circ$  at the frequency of  $\sqrt{3}rad/s$
- d) A lag-lead compensator that provides an attenuation of  $20dB$  and a phase lead of  $45^\circ$  at the frequency of  $3rad/s$

36) Consider the discrete-time system shown in the figure where the impulse response of  $(G(z))$  is  $g(0) = 0, g(1) = g(2) = 1, g(3) = g(4) = \dots = 0$ . This system is stable for the range of values of  $K$



- a)  $[-1, \frac{1}{2}]$
- b)  $[-1, 1]$
- c)  $[-\frac{1}{2}, 1]$
- d)  $[-\frac{1}{2}, 2]$

37) A signal  $x(t)$  is given by

$$x(t) = \begin{cases} 1, & -\frac{T}{4} < t \leq \frac{3T}{4} \\ -1, & \frac{3T}{4} < t \leq \frac{7T}{4} \\ -x(t+T) \end{cases}$$

Which among the following gives the fundamental Fourier term of  $x(t)$ ?

a)  $\frac{4}{\pi} \cos\left(\frac{\pi t}{T} - \frac{\pi}{4}\right)$

b)  $\frac{\pi}{4} \cos\left(\frac{\pi t}{2T} + \frac{\pi}{4}\right)$

c)  $\frac{4}{\pi} \sin\left(\frac{\pi t}{T} - \frac{\pi}{4}\right)$

d)  $\frac{\pi}{4} \sin\left(\frac{\pi t}{2T} + \frac{\pi}{4}\right)$

38) If the loop gain  $K$  of a negative feedback system having a loop transfer function  $\left[K \frac{(s+3)}{(s+8)^2}\right]$  is to be adjusted to induce a sustained oscillation then

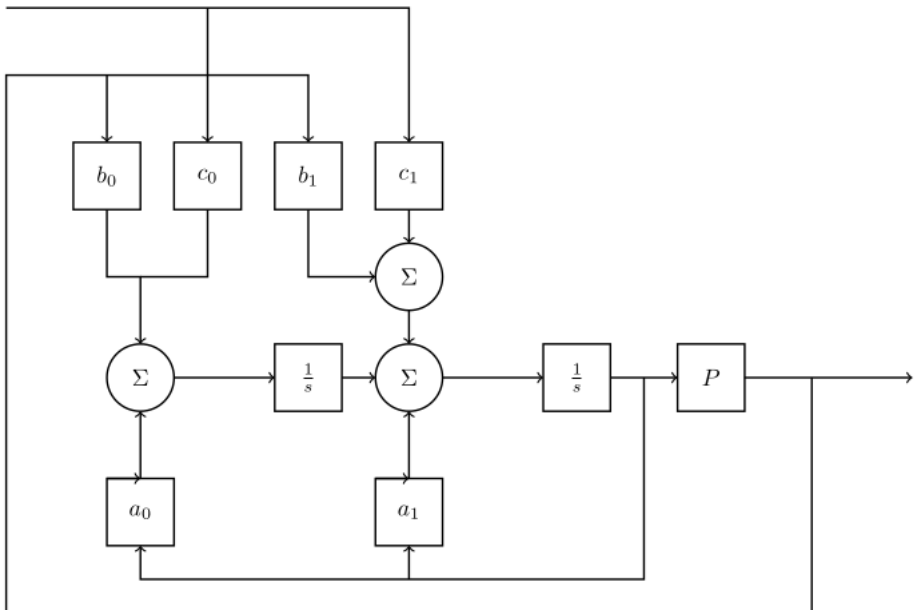
a) The frequency of this oscillation must be  $\frac{4}{\sqrt{3}} \text{ rad/s}$

b) The frequency of this oscillation must be  $4 \text{ rad/s}$

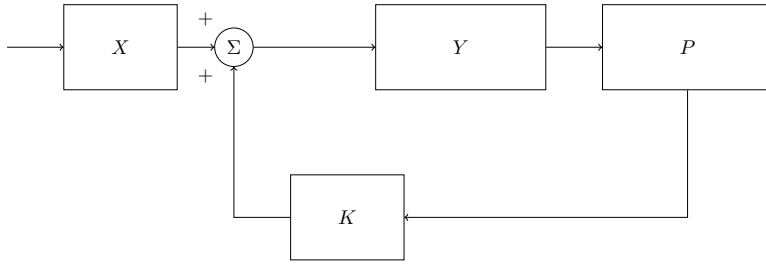
c) The frequency of this oscillation must be  $4$  or  $\frac{4}{\sqrt{3}} \text{ rad/s}$

d) such a  $K$  does not exist

39) The system shown in the figure below,



can be reduced to the form,



a)

$$\begin{aligned} X &= c_0 s + c_1 \\ Y &= \frac{1}{(s^2 + a_0 s + a_1)} \\ Z &= b_0 s + b_1 \end{aligned}$$

b)

$$\begin{aligned} X &= 1 \\ Y &= \frac{(c_0 s + c_1)}{(s^2 + a_0 s + a_1)} \\ Z &= b_0 s + b_1 \end{aligned}$$

c)

$$\begin{aligned} X &= c_0 s + c_1 \\ Y &= \frac{(b_1 s + b_0)}{(s^2 + a_1 s + a_0)} \\ Z &= 1 \end{aligned}$$

d)

$$\begin{aligned} X &= c_0 s + c_1 \\ Y &= \frac{1}{(s^2 + a_1 s + a_0)} \\ Z &= b_1 s + b_0 \end{aligned}$$

40) The value of  $\oint_C \frac{dz}{(1+z^2)}$ , where C is the contour  $|z - \frac{i}{2}| = 1$  is

a)  $2\pi i$

b)  $\pi$

c)  $\tan^{-1} z$

d)  $\pi.i.\tan^{-1} z$

41) A single-phase voltage source inverter is controlled in a single pulse-width modulated mode with a pulse width of  $150^\circ$  in each half cycle. Total harmonic distortion is defined as  $\text{THD} = \frac{\sqrt{V_{rms}^2 - V_1^2}}{V_1} \times 100$ , where  $V_1$  is the rms value of the fundamental component of the output voltage. The THD of output ac voltage waveform is

a) 65.65%

b) 48.42%

c) 31.83%

d) 30.49%

42) A voltage source inverter is used to control the speed of a three-phase, 50Hz, squirrel cage induction motor. Its slip for rated torque is 4%. The flux is maintained at the





c)  $\frac{1}{2}(t-1)u(t-1)$

d) None of the above