## Problem 10.1

Given difference equation of the following second-order system as:

$$\begin{split} y[n] &= y[n-1] + y[n-2] + x[n] \text{ Taking z-transform:} \\ Y(z)[1-z^{-1}-z^{-2}] &= X(Z) \\ \text{Hence, } H(z) &= \frac{Y(z)}{X(z)} = \frac{1}{1-z^{-1}-z^{-2}} \\ \text{The poles of the system function are found by solv} \end{split}$$

The poles of the system function are found by solving the quadratic equation in the denominator:

$$p_1 = \frac{1+\sqrt{5}}{2}$$
 and  $p_2 = \frac{1-\sqrt{5}}{2}$ 

Hence, the impulse response of the system is given as:

$$h[n] = (\frac{1+\sqrt{5}}{2})^n u[n] + (\frac{1-\sqrt{5}}{2})u[n]$$

(b) The poles are  $p_1$  and  $p_2$  which are found in (a). The system is unstable as  $p_1$  is outside the unit circle.