## Problem 10.1

Given difference equation of the following second-order system as:
$y[n]=y[n-1]+y[n-2]+x[n]$ Taking z-transform:
$Y(z)\left[1-z^{-1}-z^{-2}\right]=X(Z)$
Hence, $H(z)=\frac{Y(z)}{X(z)}=\frac{1}{1-z^{-1}-z^{-2}}$
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:
$h[n]=\left(\frac{1+\sqrt{5}}{2}\right)^{n} u[n]+\left(\frac{1-\sqrt{5}}{2}\right) u[n]$
(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.

