## Problem 4.22

(a) The sampling frequency should be greater than  $2 \times f_{max}$  of the signal. In the equation  $f_{max} = 150$  Hz.

Hence,  $f_s > 300$  Hz.

(b) When Sampling rate = 
$$f_s = 250$$
 samples/s  
 $x[n] = 2\cos(2\pi \frac{50}{250}n + \frac{\pi}{2}) + \cos(2\pi \frac{150}{250}n)$   
 $= 2\cos(0.4\pi n + \frac{\pi}{2}) + \cos(0.8\pi n)$   
(c) Spectrum:



(d) Given, output of the D-C converter is:  $y(t) = 2\cos(2\pi(50)t + \frac{\pi}{2}) + 1$ . Required to find  $f_s$ . Since the second term is 1, implies the frequency corresponding to second term, 150 Hz is aliased. This occurs when  $f_s = 150$  Hz.