

**Example 6.38** Design a low pass filter using rectangular window by taking samples of  $w(n)$  and with cut-off frequency of 1.2 rad/sec

Nov'05 (set I)

**Solution**

$$\omega_C = 1.2 \text{ rad/sec}$$

$$\text{If } T = 1 \text{ sec}$$

The cutoff frequency  $\omega_C = 1.2 \text{ rad}$

$$H_d(e^{j\omega}) = 1 \text{ for } |\omega| < 1.2$$

$$= 0 \text{ for } 1.2 \leq |\omega| \leq \pi$$

$$h_d(n) = \frac{1}{2\pi} \int_{-\pi}^{\pi} H_d(e^{j\omega}) e^{j\omega n} d\omega$$

$$= \frac{1}{2\pi} \int_{-1.2}^{1.2} e^{j\omega n} d\omega$$

$$= \frac{\sin(1.2n)}{\pi n}$$

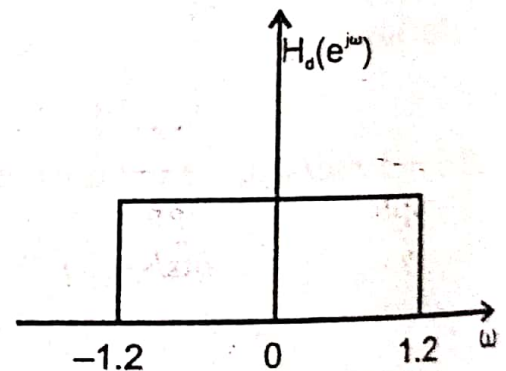
For  $N = 7$

$$h_d(0) = \frac{1.2}{\pi} = 0.387$$

$$h_d(-1) = h_d(1) = 0.2967$$

$$h_d(-2) = h_d(2) = 0.1075$$

$$h_d(-3) = h_d(3) = -0.0469$$



Example 6.41 Design a high pass filter using hamming window with a cutoff frequency of 1.2 radians/sec and  $N = 9$ . Nov'05

Solution

Given  $\omega_c = 1.2$  rad/sec

The coefficients of high pass filter

$$h_d(0) = 1 - \frac{\omega_c}{\pi} = 0.618$$

$$h_d(n) = \frac{-\sin \omega_c n}{\pi n} \quad |n| > 0$$