(a) $$H_d(\omega) = \begin{cases} 1, & |\omega| \leq \frac{\pi}{6} \\ 0, & \frac{\pi}{6} \leq |\omega| \leq \pi \end{cases}$$

$$\Rightarrow h_d(n) = \frac{1}{2\pi} \int_{-\pi/6}^{\pi/6} H_d(\omega) e^{-j\omega n} \, d\omega$$

To obtain N=51, a delay of $\frac{51-1}{2} = 25$ is added to $H_d(\omega)$

$$\Rightarrow h_d(n) = \frac{\sin\left(\pi \cdot (n-12)/6\right)}{\pi \cdot (n-12)}$$

For a rectangular window → $w(n)$

$$h(n) = h_d(n) \cdot w(n)$$

[Graph uploaded]

(c) Similarly,

The graph for blackman window is also uploaded

(d) Comparing graphs for Rectangular and Blackman window, we see →

(i) Transcition region
- Much steeper for Rectangular
- Gradual curve for Blackman

(ii) Side-Lobe levels

- There is an ~~decrease~~ increase in magnitude (-ve) of side-lobe levels.
- However, the range of side-lobe remains almost unchanged

(d) We see that the observations from
cont. 9.2(b),(c) coincide with the properties
of rectangular and blackman window
from 9.1