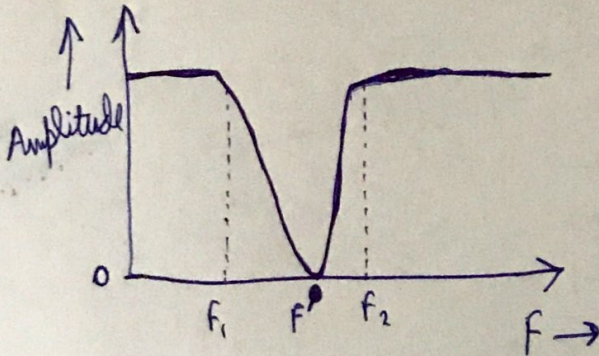


Ans. 2) Strong periodic horizontal lines in time domain will lead to a vertical white line in the frequency domain.

"Notch Filter" will be used to eliminate these lines.

$$\text{Notch filter} \Rightarrow H(u, v) = \begin{cases} 0, & u=0, v=0 \\ 1, & \text{otherwise} \end{cases}$$

Notch filter notches out ~~a~~ a particular frequency other than the d.c. component.



Ans. 1) $f(x, y) = \delta(x - (N-1), y) + \delta(x-1, y)$

$$F[k, l] = \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} f(x, y) \cdot (e)^{-j 2 \pi \left[\frac{kx}{N} + \frac{ly}{M} \right]}$$

$$F[k, l] = \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} \delta(x - (N-1), y) \cdot (e)^{-j 2 \pi \left[\frac{kx}{N} + \frac{ly}{M} \right]}$$

$$+ \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} \delta(x-1, y) \cdot (e)^{-j 2 \pi \left[\frac{kx}{N} + \frac{ly}{M} \right]}$$

$$F[k, l] = \sum_{x=0}^{N-1} \sum_{y=0}^{M-1} \left[1 \cdot (e)^{-j \cdot 2\pi \left[\frac{k(N-1)}{N} + 0 \right]} + 1 \cdot (e)^{-j \cdot 2\pi \left[\frac{k}{N} + 0 \right]} \right]$$

$$F[k, l] = (e)^{-j \cdot 2\pi \left[\frac{k(N-1)}{N} \right]} + (e)^{-j \cdot 2\pi \left[\frac{k}{N} \right]}$$

~~$$F[k, l] = (e)^{-j \cdot 2\pi \left[\frac{k(N-1)}{N} \right]} + (e)^{-j \cdot 2\pi \left[\frac{k}{N} \right]}$$~~

$$F[0, 0] = (e)^0 + (e)^0 = 1 + 1 = 2 \Rightarrow \text{D.C. value passes (A)}$$

$$F\left[\frac{N}{2}, \frac{M}{2}\right] = (e)^{-j \cdot 2\pi \left[\frac{N}{2} \cdot \frac{(N-1)}{N} \right]} + (e)^{-j \cdot 2\pi \left[\frac{N}{2} \cdot \frac{1}{N} \right]}$$

$$F\left[\frac{N}{2}, \frac{M}{2}\right] = (e)^{-j \cdot \pi (N-1)} + (e)^{-j \cdot \pi} = -1 + -1 = -2$$

$$F\left[\frac{N}{2}, \frac{M}{2}\right] = (e)^{-j \cdot \pi N} \cdot (e)^{j \cdot \pi} = -1 \cdot -1 = 1$$

$$F\left[\frac{N}{2}, \frac{M}{2}\right] = - (e)^{-j \cdot \pi N} = -1$$

$$F\left[\frac{N}{2}, \frac{M}{2}\right] = (-1)^1 \cdot (-1)^N = -1$$

$$F\left[\frac{N}{2}, \frac{M}{2}\right] = (-1)^{N+1} \Rightarrow \text{when } N \text{ is even} \Rightarrow -2$$

$$N \text{ is odd} \Rightarrow 0$$

$$\text{when } N \rightarrow \infty \Rightarrow (-1)^{N+1} = 1 - 1 = 0$$

very high frequencies are blocked (B)

(A) and (B) \Rightarrow It is a Low Pass filter as D.C. value passes through and high frequency components are blocked.