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$$g(x,y) = f(x,y) * h(x,y)$$

$$\Rightarrow g(x,y) = \sum_{p}\sum_{q} f(p,q)\, h(x-p, y-q)$$

$\Rightarrow$ We know DFT of $g(x,y)$

$$Y(u,v) = \sum_{x}\sum_{y} g(x,y)\, e^{-j2\pi(ux/M + vy/N)}$$

$\Rightarrow$ Putting value of $g(x,y)$

$$Y(u,v) = \sum_{x}\sum_{y}\left[\sum_{p}\sum_{q} f(p,q)\, h(x-p, y-q)\right] \times$$

$$e^{-j2\pi(ux/M + vy/N)} \times e^{-j2\pi(up/M + vq/N)} \times$$

$$e^{+j2\pi(up/M + vq/N)}$$

$$\Rightarrow Y(u,v) = \sum_{x}\sum_{y}\sum_{p}\sum_{q} f(p,q)\, e^{-j2\pi(up/M + vq/N)}$$

$$\times h(x-p, y-q)\, e^{-j2\pi\left(\frac{u(x-p)}{M} + \frac{v(y-q)}{N}\right)}$$

$$= F(u,v) \times \sum\sum h(x-p, y-q)\, e^{-j2\pi\left[\frac{u(x-p)}{M} + \frac{v(y-q)}{N}\right]}$$

$$\Rightarrow Y(u,v) = F(u,v)\, H(u,v)$$