

Ans2:- We have

$$g_1 = f_1 + h_2 * f_2$$

$$g_2 = h_1 * f_1 + f_2$$

Since we're more comfortable with working in the Fourier domain,

$$F(g_1) = F(f_1) + F(h_2 * f_2)$$

$$\Rightarrow F(g_1) = F(f_1) + F(h_2) \cdot F(f_2)$$

$$\Rightarrow \boxed{F(f_1) = F(g_1) - F(h_2) \cdot F(f_2)}$$

Similarly

$$F(g_2) = F(h_1) \cdot F(f_1) + F(f_2)$$

$$\Rightarrow F(g_2) = F(h_1) \cdot (F(g_1) - F(h_2) \cdot F(f_2)) + F(f_2)$$

$$\Rightarrow F(f_2) = \frac{F(g_2) - F(h_1) F(g_1)}{1 - F(h_1) \cdot F(h_2)}$$

Similarly

$$F(f_1) = \frac{F(g_1) - F(h_2) F(g_2)}{1 - F(h_1) \cdot F(h_2)}$$

Here '/' is element-wise division.

Now as we see, if

$F(h_1) \cdot F(h_2)$ returns a matrix of all 1s,
we'll have an all-0 matrix in the denominator.
 $\therefore F(f_2)$ will be undefined here.