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we have

$$x(t) = \operatorname{Re} (\tilde{x}(t) e^{j2\pi f_c t})$$

\therefore

$$y(t) = x(t-\tau)$$

$$= \operatorname{Re} (\tilde{x}(t-\tau) e^{j2\pi f_c (t-\tau)})$$

$$= \operatorname{Re} (\tilde{x}(t-\tau) e^{j2\pi f_c \tau} e^{j2\pi f_c t})$$

$$= \operatorname{Re} (\tilde{y}(t) e^{j2\pi f_c t})$$

hence

$$\tilde{y}(t) = \tilde{x}(t-\tau) e^{j2\pi f_c \tau}$$