(4)

$\therefore$ Fourier $\left\{ (x^I(t) + jx^Q(t))\, e^{j2\pi f_c t} \right\}$

$$= 2X_+(f) \quad \text{— (6)}$$

we know that

if $y(t) \rightleftharpoons Y(f)$, then

$$y^*(t) \rightleftharpoons Y^*(-f).$$

using this property in (5) we get

$\therefore$ Fourier $\left\{ (x^I(t) - jx^Q(t))\, e^{-j2\pi f_c t} \right\}$ — (7)

$$= 2X_+^*(-f)$$

$$= 2X_-(f) \Leftarrow \left(\text{using } (2)\right)$$

$\therefore$ using (6) and (7) we have

2 Fourier $\left\{ \text{Real}\left[(x^I(t) + jx^Q(t))\, e^{j2\pi f_c t} \right] \right\}$

$$= 2\,(X_+(f) + X_-(f))$$

$$= X(f)$$

$\therefore$ $Z(f) = X(f)$, which then implies that $x(t) = z(t) = x_I(t)\cos 2\pi f_c t - x_Q(t)\sin 2\pi f_c t.$