

Solutions to Tutorial- II.

①

Q.1.

Q)

$$x(t) = 0.5 \cos(20000\pi t + \pi/6) \\ = 0.5 \operatorname{Re}(e^{j(20000\pi t + \pi/6)})$$

$x(t)$ is a ^{pure} cosine wave at
 $f = 10 \text{ kHz}$, and therefore
for this signal we have

$$f_c = 10 \text{ kHz}.$$

$$x(t) = 0.5 \operatorname{Re}(e^{j\pi/6} e^{j2\pi f_c t}) \\ = \operatorname{Re}(\tilde{x}(t) e^{j2\pi f_c t})$$

$$\therefore \tilde{x}(t) = 0.5 e^{j\pi/6}.$$

b)

$$x(t) = \frac{1}{4} \cos(2\pi f_1 t + \pi/4) + \sin(2\pi f_2 t + \pi/3) \\ \text{where } f_1 = 10 \text{ kHz}, f_2 = 10.05 \text{ kHz}.$$

Therefore the band pass signal $x(t)$ is
band limited to $[10 \text{ kHz}, 10.05 \text{ kHz}]$.