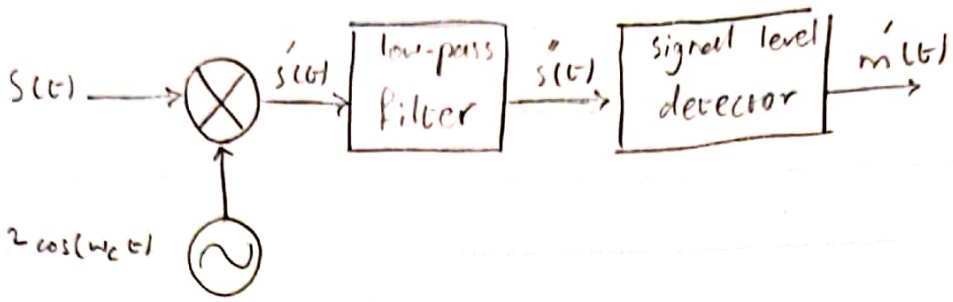
پاسخ تمرین سری دوم انتقال داده‌ها

Subject | Year: Month: Date:

1) $$s(t) = \begin{cases} A\cos(w_c t) & , m(t)=1 \\ A\cos(w_c t+\varphi) & , m(t)=0 \end{cases}$$



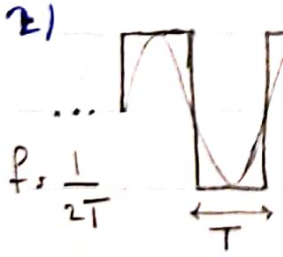
$$s(t) \times A\cos(w_c t) = \begin{cases} 2A\cos^2(w_c t) & , m(t)=1 \\ 2A\cos(w_c t+\varphi)\cos(w_c t) & , m(t)=0 \end{cases}$$

$$s'(t) = \begin{cases} A(1+\cos(2w_c t)) & , m(t)=1 \\ A\cos(2w_c t+\varphi)+A\cos(\varphi) & , m(t)=0 \end{cases}$$

$$s''(t) = \begin{cases} A & , m(t)=1 \\ A\cos(\varphi) & , m(t)=0 \end{cases} \Rightarrow m'(t) = \begin{cases} 1 & , m(t)=1 \\ 0 & , m(t)=0 \end{cases}$$

---

2)

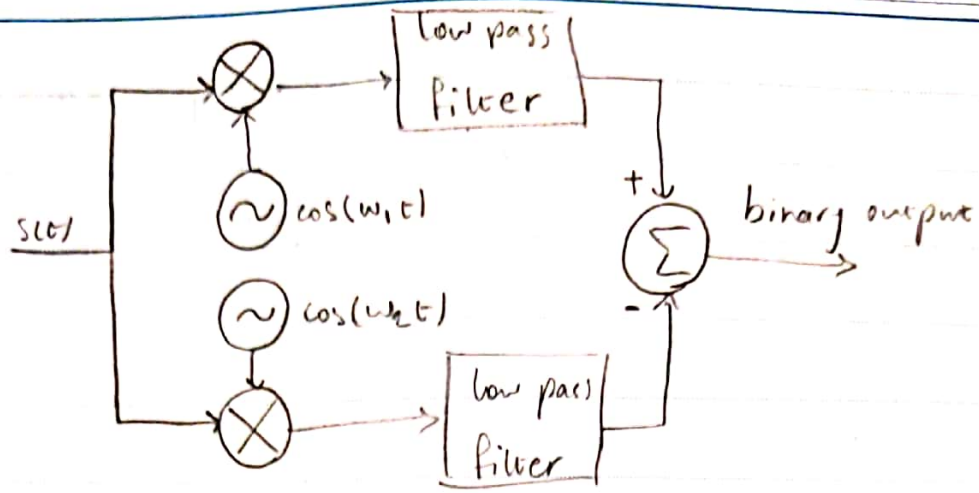


$$\ldots \ldots = \sum_{k=1}^{\infty} \sin\left(2\pi \times \frac{1}{2T} t\right) + \frac{1}{3}\sin\left(2\pi \times \frac{3}{2T} t\right) + \frac{1}{5}\sin\left(2\pi \times \frac{5}{2T} t\right) + \ldots$$

$f_c = \frac{1}{2T}$ ASK, PSK: $\left[\sin\left(2\pi \times \frac{1}{2T} t\right) + \frac{1}{3}\sin\left(2\pi \times \frac{3}{2T} t\right) + \frac{1}{5}\sin\left(2\pi \times \frac{5}{2T} t\right)\right] \times 2\cos(2\pi f_c t)$

Eiffel

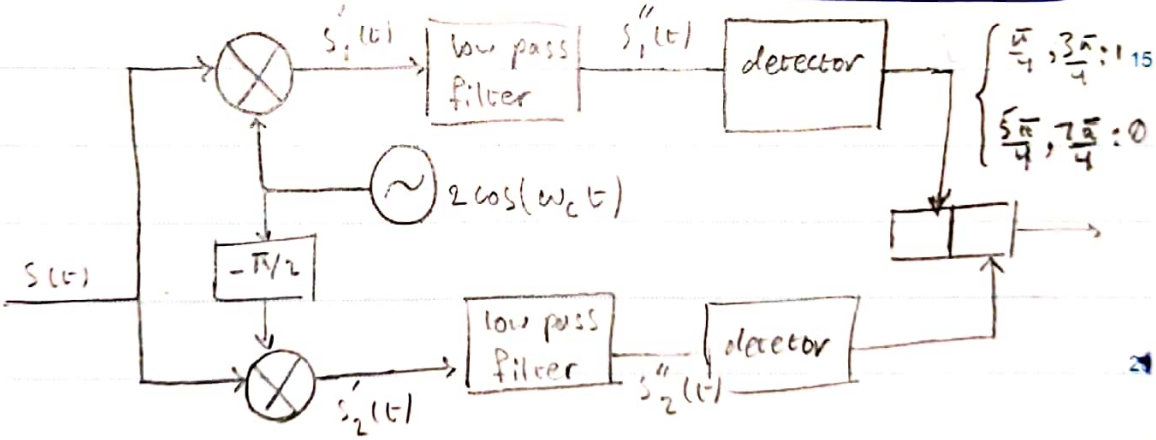
FSK :



3)

$$s(t) = \begin{cases} A\cos(\omega_c t) + A\sin(\omega_c t), & m(t) = 00 \\ -A\cos(\omega_c t) + A\sin(\omega_c t), & m(t) = 10 \\ A\cos(\omega_c t) - A\sin(\omega_c t), & m(t) = 01 \\ -A\cos(\omega_c t) - A\sin(\omega_c t), & m(t) = 11 \end{cases}$$

4)



$\boxed{\frac{\pi}{4}}$: $A\cos\left(\omega_c t + \frac{\pi}{4}\right) \times 2\cos(\omega_c t) = A\cos\left(2\omega_c t + \frac{\pi}{4}\right) + A\cos\left(\frac{\pi}{4}\right) = s_1'(t)$

$A\cos\left(\omega_c t + \frac{\pi}{4}\right) \times 2\cos\left(\omega_c t - \frac{\pi}{2}\right) = A\cos\left(2\omega_c t - \frac{\pi}{4}\right) + A\cos\left(\frac{3\pi}{4}\right) = s_2'(t)$

$\Rightarrow s_1''(t) = A\cos\frac{\pi}{4}$, $s_2''(t) = A\cos\left(\frac{3\pi}{4}\right)$

$\boxed{\frac{3\pi}{4}}$, $A\cos\left(\omega_c t + \frac{3\pi}{4}\right) \times 2\cos(\omega_c t) = A\cos\left(2\omega_c t + \frac{3\pi}{4}\right) + A\cos\left(\frac{3\pi}{4}\right) = s_1'(t)$

$A\cos\left(\omega_c t + \frac{3\pi}{4}\right) \times 2\cos\left(\omega_c t - \frac{\pi}{2}\right) = A\cos\left(2\omega_c t + \frac{\pi}{4}\right) + A\cos\left(\frac{5\pi}{4}\right) = s_2'(t)$

$\Rightarrow S_1''(t) = A\cos\frac{3\pi}{4}$, $S_2''(t) = A\cos\left(\frac{5\pi}{4}\right)$

$\boxed{\frac{5\pi}{4}}$ $A\cos\left(\omega_c t + \frac{5\pi}{4}\right) \times 2\cos(\omega_c t) = A\cos\left(2\omega_c t + \frac{5\pi}{4}\right) + A\cos\left(\frac{5\pi}{4}\right) = S_1'(t)$

$A\cos\left(\omega_c t + \frac{5\pi}{4}\right) \times 2\cos\left(\omega_c t - \frac{\pi}{2}\right) = A\cos\left(2\omega_c t + \frac{3\pi}{4}\right) + A\cos\left(\frac{7\pi}{4}\right) = S_2'(t)$

$\Rightarrow S_1''(t) = A\cos\frac{5\pi}{4}$, $S_2''(t) = A\cos\frac{7\pi}{4}$

$\boxed{\frac{7\pi}{4}}$ $A\cos\left(\omega_c t + \frac{7\pi}{4}\right) \times 2\cos(\omega_c t) = A\cos\left(2\omega_c t + \frac{7\pi}{4}\right) + A\cos\left(\frac{7\pi}{4}\right) = S_1'(t)$

$A\cos\left(\omega_c t + \frac{7\pi}{4}\right) \times 2\cos\left(\omega_c t - \frac{\pi}{2}\right) = A\cos\left(2\omega_c t + \frac{5\pi}{4}\right) + A\cos\left(\frac{\pi}{4}\right) = S_2'(t)$

$\Rightarrow S_1''(t) = A\cos\frac{7\pi}{4}$, $S_2''(t) = A\cos\frac{\pi}{4}$