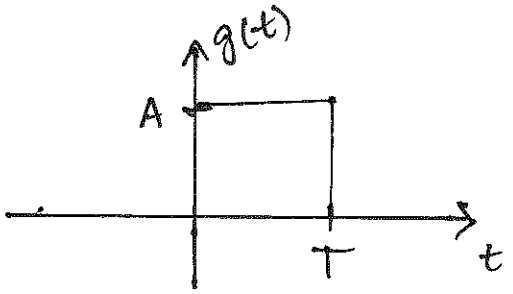
Prob 2.1

$g(t) = g_{rec}(t)$



b = 1 0 1 1 0 1

(a) Draw transmitted signal $s(t)$, Binary PAM ($M=2$)

$T_b = T$

For M-PAM

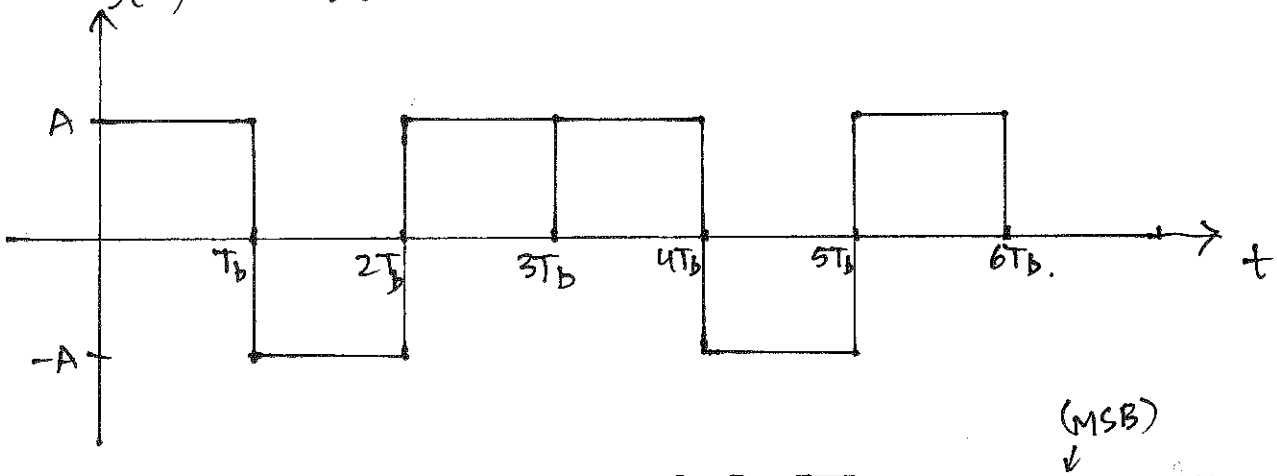
$$\begin{cases} s_l(t) = A_l\, g(t) \\ A_l = -M+1+2l \end{cases} \qquad l = 0, 1, \ldots M-1$$

For binary PAM, the message will be either 0 or 1

$l=0 \rightarrow A_0 = -1 \rightarrow s_0(t) = -g(t)$

$l=1 \rightarrow A_1 = 1 \rightarrow s_1(t) = g(t)$

$m[0]=1,\ m[1]=0,\ m[2]=1,\ m[3]=1,\ m[4]=1,\ m[5]=0,\ m[6]=1$



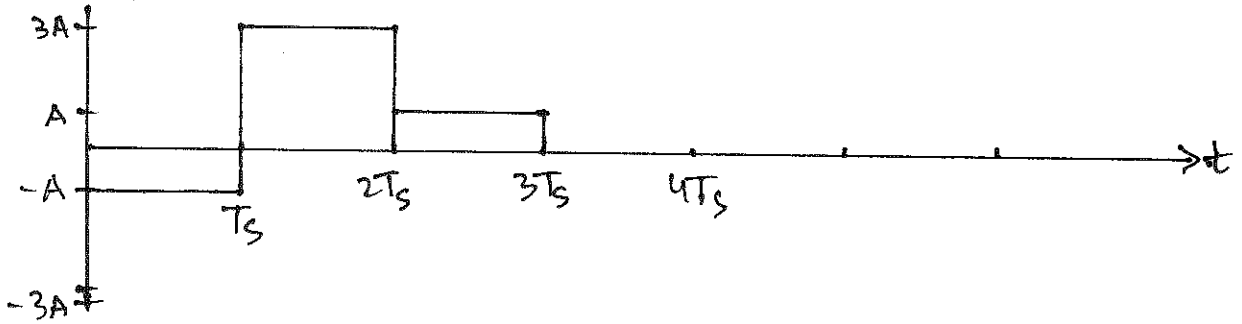
(b) 4-PAM, $M=4$ $\quad l = 0, 1, 2, 3$, $T_s = T$

(MSB)

10 $\quad$ 11

$m[0]=1,\ m[1]=3,\ m[2]=2$ and

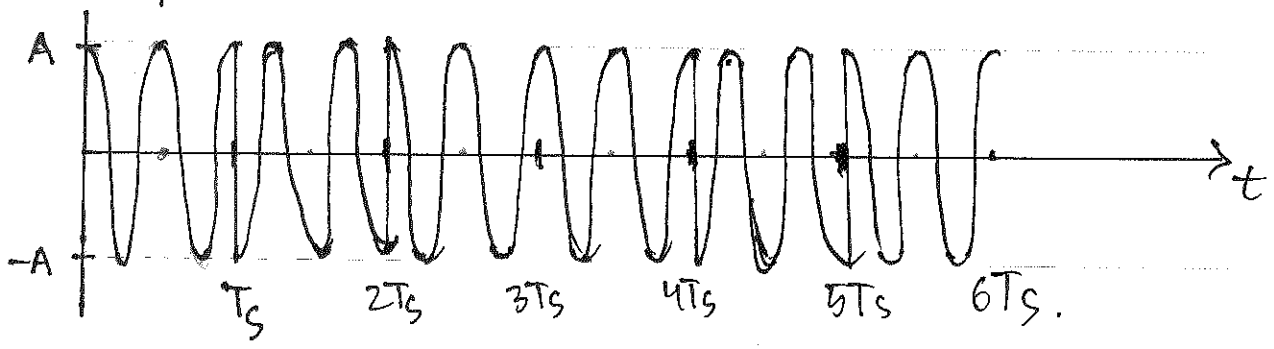
$A_0 = -3$, $A_1 = -1$, $A_2 = 1$, $A_3 = 3$



Prob 2.2 $f_c = \frac{2}{T_s}$, bandpass PAM

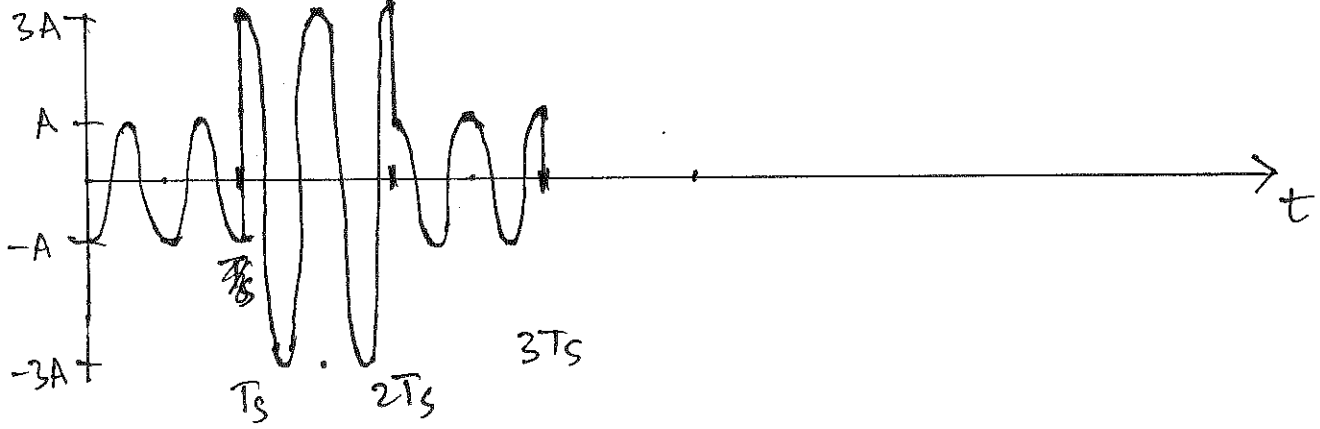
(a) M=2 PAM (bandpass) $\varphi(t) = 0$.

$$s_{bp}(t) = s(t)\cos(2\pi f_c t) = \sum_{i=0}^{\infty} A_{m[i]}\, g(t - iT_s)\cos(2\pi f_c t)$$



(b) M= 4 PAM bandpass

$A_0 = [-3]$, $A_1 = -1$, $A_2 = 1$, $A_3 = 3$

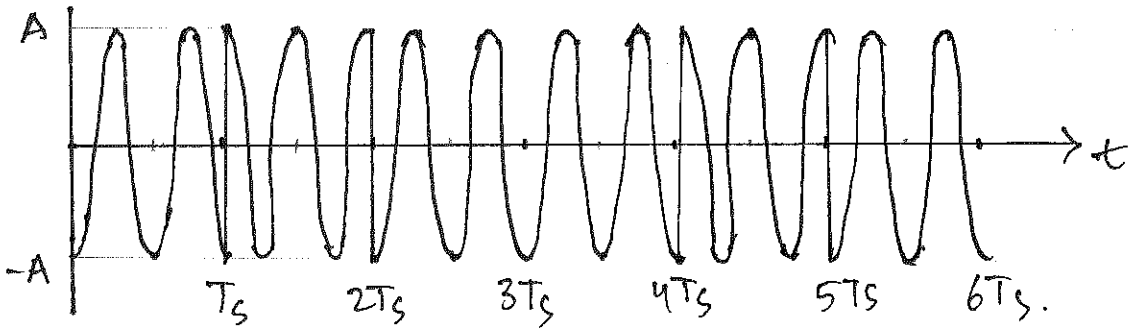


Prob 2.3 | M-PSK , $v_{const} = 0$

$$s_\ell(t) = g(t)\cos(2\pi f_c t + v_\ell)$$

$$v_\ell = \frac{2\pi}{M}\ell + v_{const}$$

(a) $v_0 = 0$, $v_1 = \pi$ $\Rightarrow$ $s_0(t) = g(t)\cos(2\pi f_c t)$, $s_1(t) = g(t)\cos(2\pi f_c t + \pi)$



b Binary PAM = -1 (Binary PSK) in this case.

(b) $M = 4$

$v_0 = 0$, $v_1 = \frac{\pi}{2}$, $v_2 = \pi$, $v_3 = \frac{3\pi}{2}$

$s_0(t) = g(t)\cos(2\pi f_c t)$, $s_1(t) = g(t)\cos(2\pi f_c t + \frac{\pi}{2})$

$s_2(t) = g(t)\cos(2\pi f_c t + \pi)$, $s_3(t) = g(t)\cos(2\pi f_c t + \frac{3\pi}{2})$