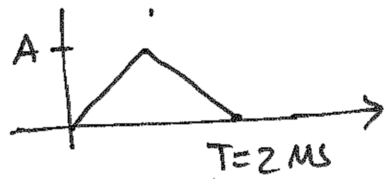
10.1

$$h(t) = \sum_{i=1}^{2} \alpha_i \delta(t - \tau_i)$$

$$h(t) = \alpha_1 \delta(t - \tau_1) + \alpha_2 \delta(t - \tau_2)$$

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

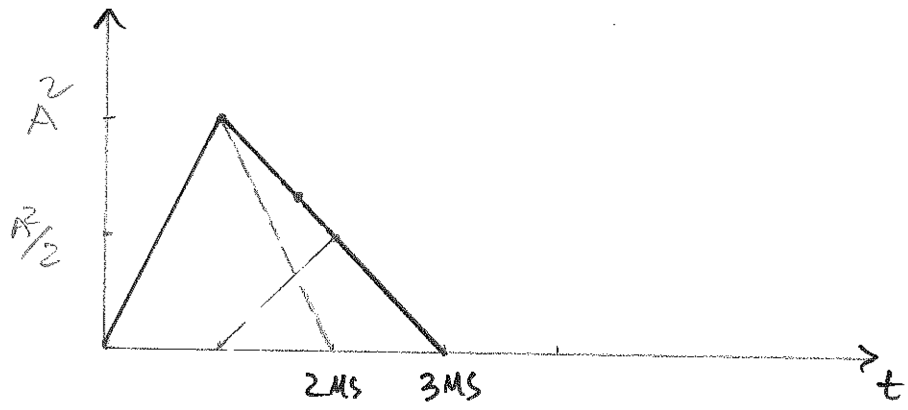
$g(t)$



(a) Largest bit rate for which ther is no signal overlap.

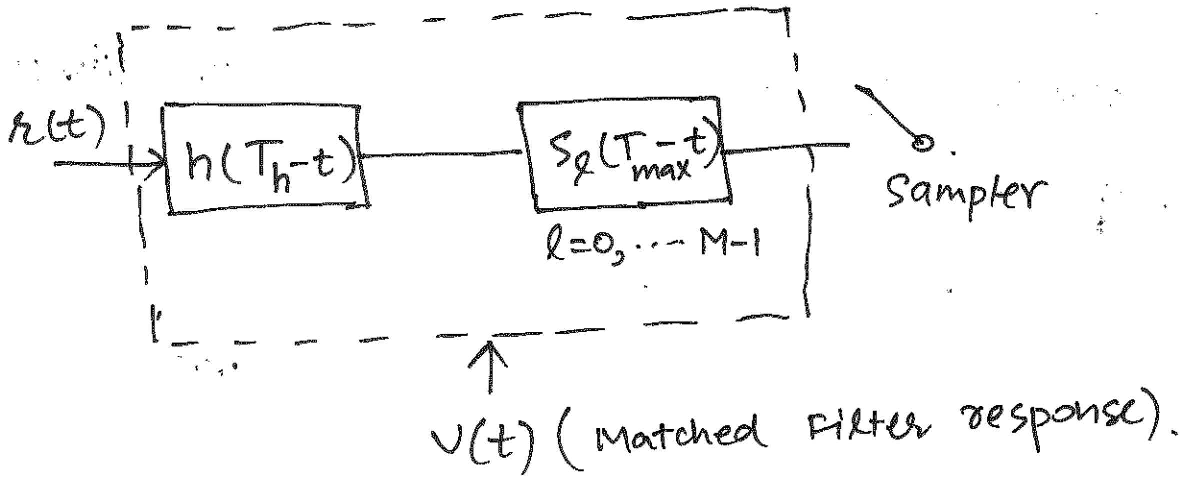
$$R_b = \frac{1}{3\mu s} = .33 \text{ Mbps}$$

(b)



(C) - ML receiver with channel Matching filter:
Refer to Lecture notes 9 (Fig. 4.17 compendium)

- Impulse response of the Matched filter:
To deal with overlapping waveforms, each matched filter in $Z_\ell(T_s - t)$ in Fig. 4.9 can be replaced with two matched filters in cascade. i.e.,



where $T_h = 1\ \mu s$ in this problem.

10.1(c) | alternative solution.

Matched filter of an ML receiver should have a response

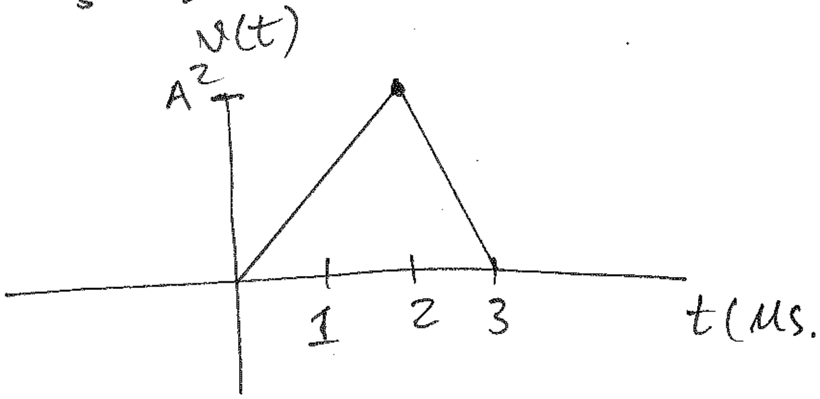
$$v(t) = z_1(T_s - t)$$

where $T_s = T_{max} + T_h$ (Eq 4.144)

T_{max} in this case is 2 μs.

and $T_h = \tau_2 = 1$ μs.

∴ $T_s = 3$ μs.



Prob 10.2

$$g(t) = g_{rec}(t), \quad T = 1\mu s$$

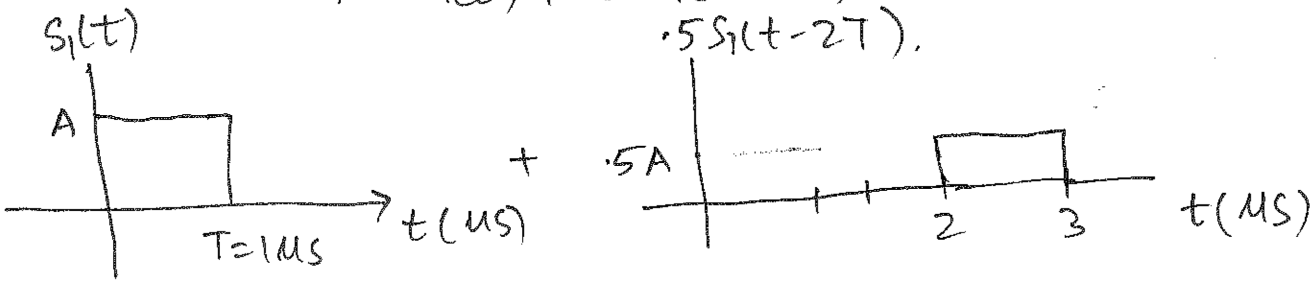
$$h(t) = \delta(t) + .5\,\delta(t-2T)$$

(a) If $s_1(t) = +1\,g(t)$ is transmitted then

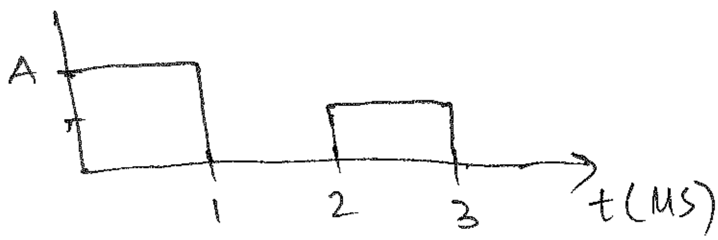
$$z_1(t) = s_1(t) * h(t)$$

$$z_1(t) = s_1(t) * [\,\delta(t) + .5\,\delta(t-2T)\,]$$

$$z_1(t) = s_1(t) + .5\,s_1(t-2T)$$

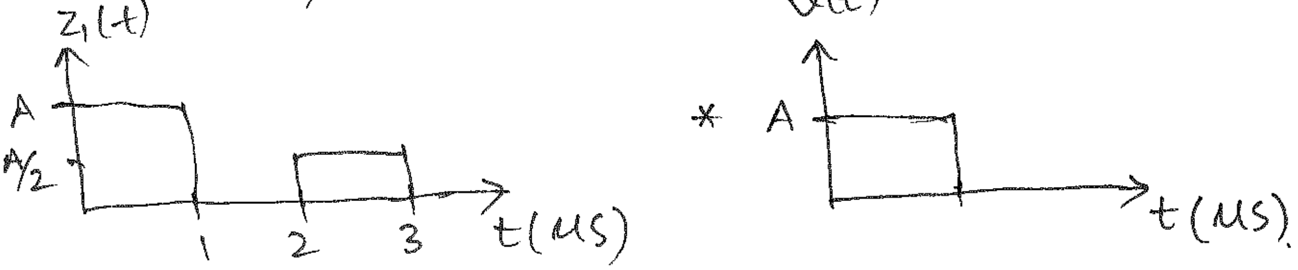


and $z_1(t)$ is



(b) Let $v(t) = g(T-t)$

then $z_1(t) * v(t)$



$$\cdot\ z_1(t) * v(t)$$

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