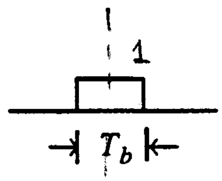
SAMPLE MIDTERM #7

EE 276 Homework #6

1.

Given: $u(t) =$ 

= signaling wave form
="shape of bits"
= pulse shape

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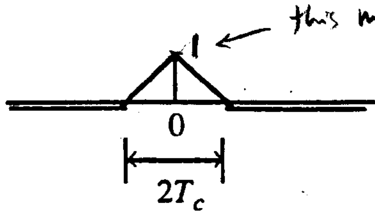
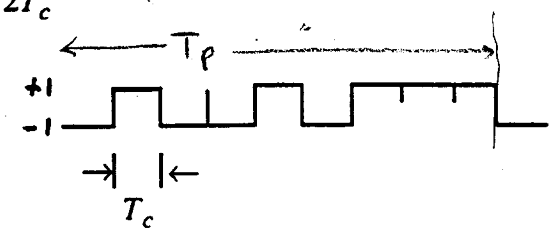
$PN(t)$=Pseudo Noise Sequence
with time autocorrelation

$$R_{PN}(\tau) = \frac{1}{T_P}\int_0^{T_P} PN(t)PN(t-\tau)dt$$

this must be 1

= 


and $T_c$ = chip period 


Repeat period, $T_P$, of the sequence ~~is~~ satisfies:

$T_P >> T_C$ i.e. $N$>>1

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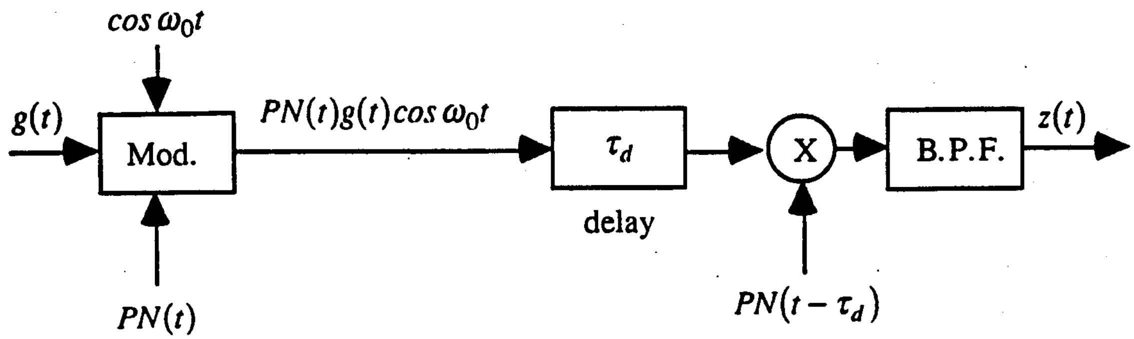
$$g(t) = \sum_{m=-\infty}^{\infty} I_m u(t - mT_b)$$
= "bit stream"

For the following:




delay element
has impulse response $\delta(t-\tau_d)$

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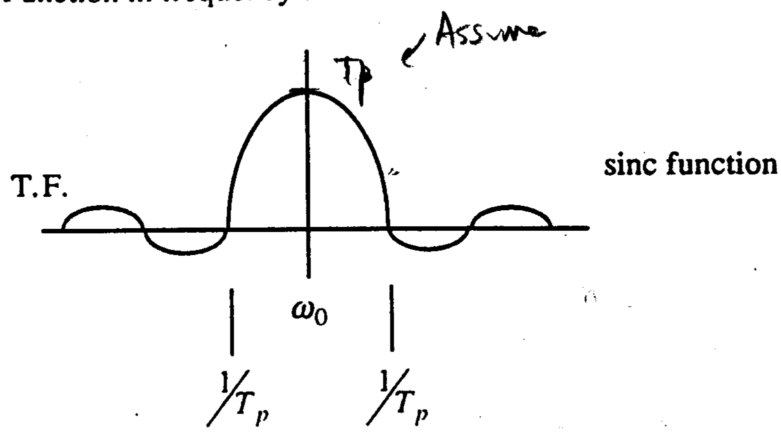
B.P.F. has Transfer Function in frequency domain

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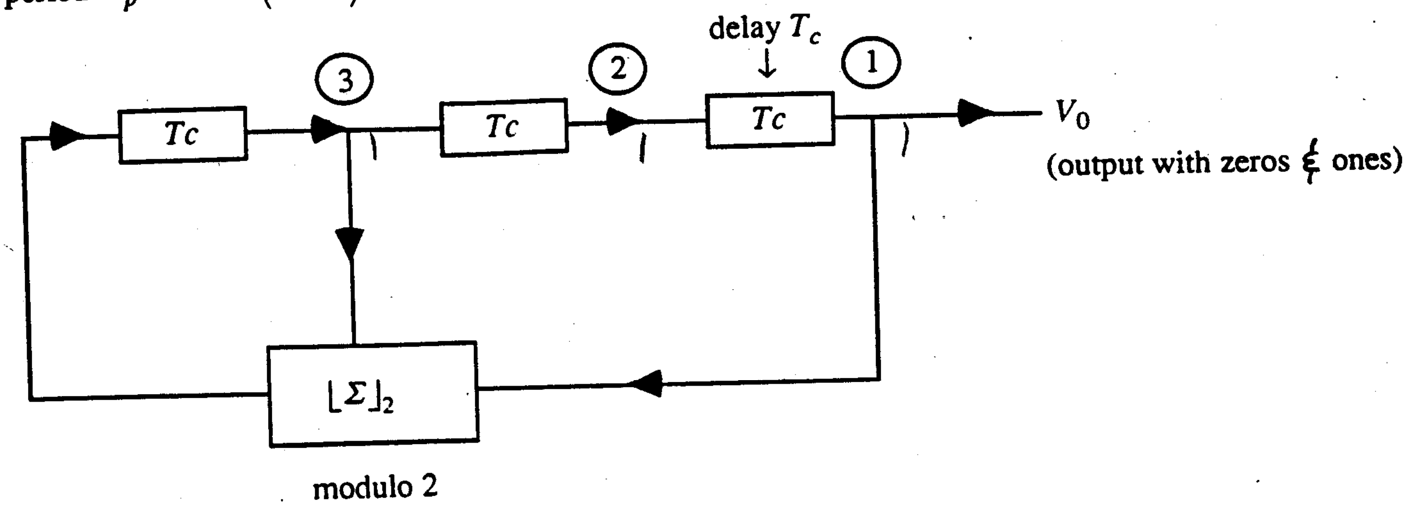
$T_c << T_p << T_b$ $\qquad$ $\frac{1}{T_p} \gg \frac{1}{T_b}$

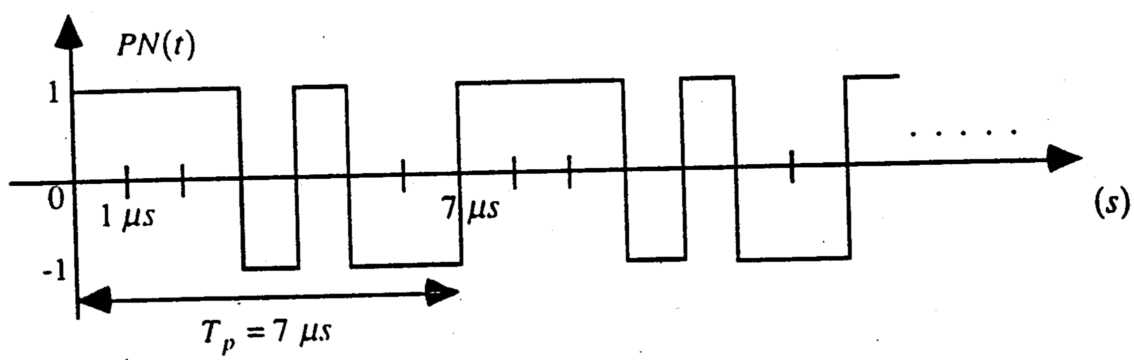
Find the approximate output of the Band Pass Filter (BPF), i.e. Find $z(t)$ in terms of $g(t)$, $\cos \omega_0 t$, $\tau_d$ (and any other needed parameters). (Make appropriate approximations.)

2.

One way of generating pseudo-noise (PN) sequences is using shift register with linear feedback. The following diagram shows a 3-stage shift register which can generate a PN sequence with period $T_p = nTc = (2^3 - 1)Tc = 7Tc$:




If the initial states at point 1, 2, 3 are 1, 1 and 1, then the output would be: 1 1 1 0 1 0 0, 1 1 1 0 1 0 0, ... If we pass this output sequence into another circuit which changes 0 into -1 and keeps 1 unchanged, the final PN sequence is 1 1 1 -1 1 -1 -1, 1 1 1 -1 1 -1 -1, ... For convenience in calculation, choose $T_c = 1\ \mu s$, so $T_p = 7\ \mu s$.




We want to transmit one pulse only $g(t)$ through a channel with impulse response $h(t) = \delta(t - 1\ \mu s) - \delta(t - 3\ \mu s)$ with carrier frequency fc=100 MHz.