Q1: Draw Continuous-time amplitude modulation with a pulse carrier:

p(t)

x(t) ——→ ✕ ——→ y(t)

A1:

x(t)

p(t)

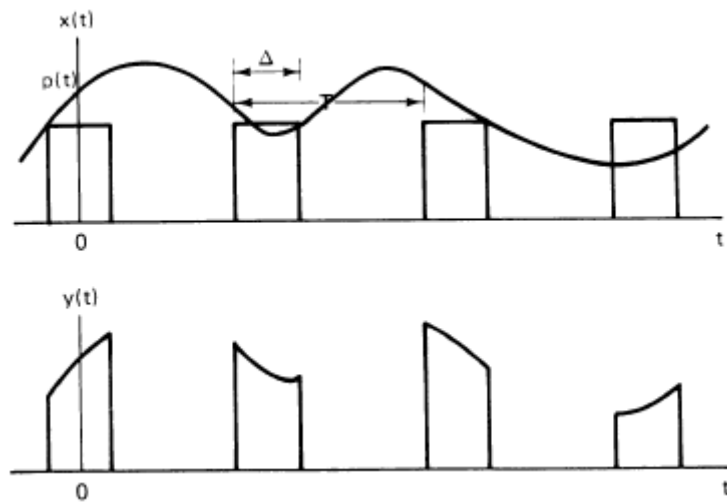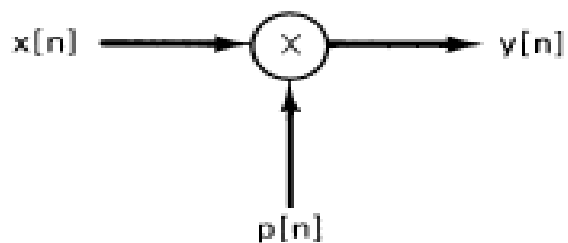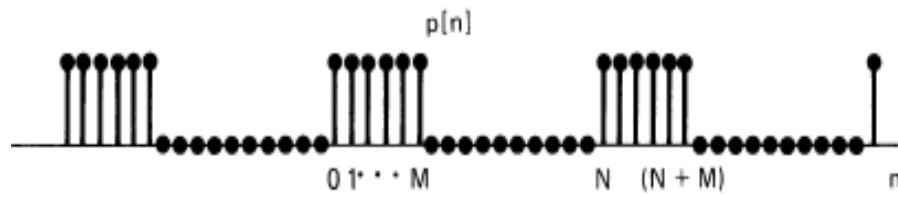0   t

y(t)

0   t
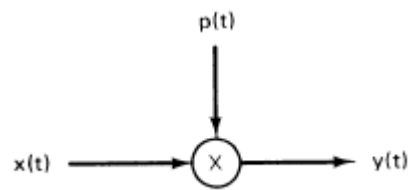
Q2:Draw Discrete-time amplitude modulation with a pulse carrier.

x[n] ——→ ✕ ——→ y[n]
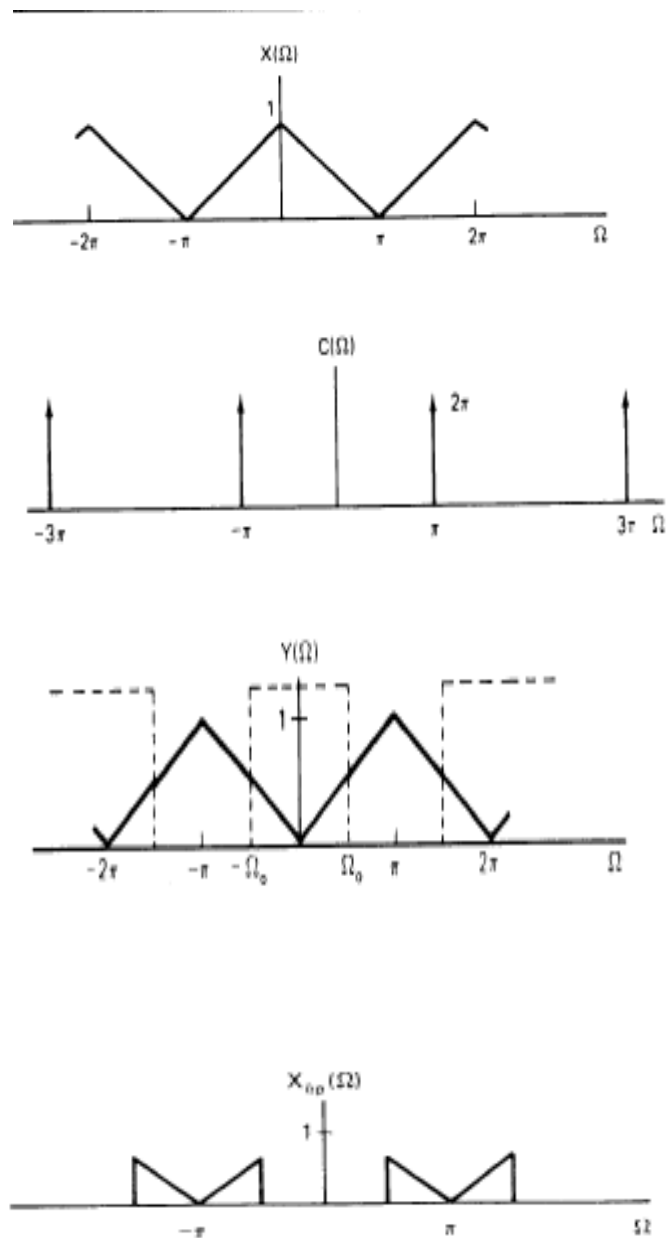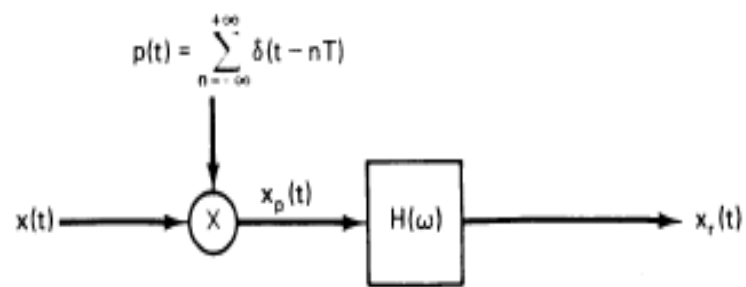
p[n]

p[n]

0 1ᐧ ᐧ ᐧ M   N   (N + M)   n

A2:

Q3: Draw Spectra associated with the use of modulation and demodulation to implement high pass
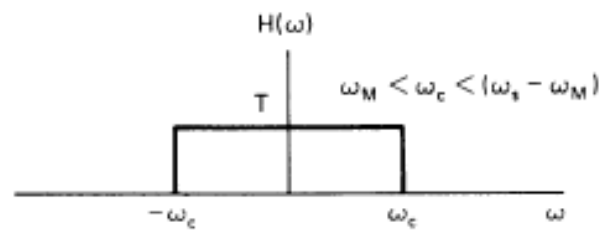filtering using a low pass filter.

X(Ω)

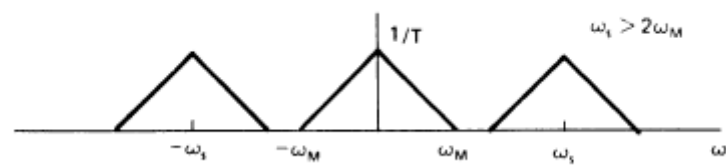A3:

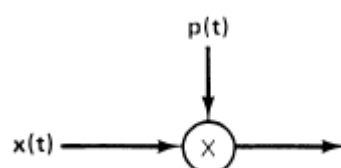C(Ω)

Y(Ω)

$X_{op}(\Omega)$

Q4: Modulation and demodulation with an impulse train carrier:

$$p(t) = \sum_{n=-\infty}^{+\infty} \delta(t - nT)$$

$x(t)$ —→ ⊗ → $x_p(t)$ → $H(\omega)$ → $x_r(t)$

A4:

$1/T$ $\omega_s > 2\omega_M$

$-\omega_s$ $-\omega_M$ ω_M ω_s ω

$H(\omega)$

T $\omega_M < \omega_c < (\omega_s - \omega_M)$

$-\omega_c$ ω_c ω

Q5: Draw Amplitude modulation with a pulse carrier with the pulses chosen to have unit area.

$p(t)$

$x(t)$ —→ ⊗ →

A5:

x(t)
p(t)

|← T →|

$\frac{1}{\Delta}$

|←→|
Δ

t

x(t) p(t)

t
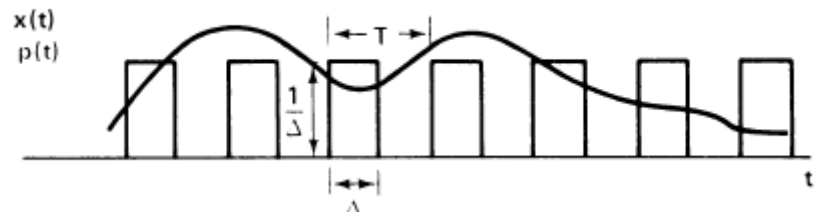
Q6: Amplitude modulation with a pulse carrier in the limit as the pulse width approaches zero and the pulse area remains unity. This corresponds to amplitude modulation with an impulse train carrier.

p(t)

x(t) ——→ ⊗ ——→

A6:

x(t)
p(t)

$\overset{1}{\rightarrow}|\leftarrow T \rightarrow|$

t

x(t) p(t)
$\overset{\Delta}{=} x_p(t)$

x(nT)   x(nT + T)

t