1) Let
\[x_1(t) = \text{rect}(-\frac{t}{0.1}) \text{ and } x_2(t) = \text{rect}(-\frac{t}{0.5})\]

a) Sketch \(x_1(t)\) and \(x_2(t)\)

b) The bandwidth of \(x_1(t)\) is larger than the bandwidth of \(x_2(t)\). Circle True or False.

2) A linear time invariant system has a frequency transfer function \(H(f)\) given below.

Frequency Transfer Function

The input to this system is \(x(t) = \cos(\pi t)\). The system output signal \(y(t)\) is:

i) \(y(t) = \cos(2\pi t)\)

ii) \(y(t) = 0.5\cos(\pi t)\)

iii) \(y(t) = 4\cos(\pi t)\)

iv) or none of the above

Circle the correct answer.
3) A periodic signal \( x(t) \) is defined as
\[
x(t) = \sum_{k=-\infty}^{\infty} \text{rect} \left( \frac{t-kT_0}{\tau} \right)
\]
where \( \tau = 1 \mu s \) and \( T_0 = 20 \mu s \).

\( x(t) \) is input to an ideal bandpass filter \( H(f) \) with a center frequency of 25 kHz and bandwidth \( B = 5 \) kHz.

\( \mathcal{F} x(t) \)

a) The fundamental frequency of \( x(t) \) is
(i) 50 kHz
(ii) 1 MHz
(iii) 10 MHz
i) or none of the above
Circle the correct answer.

\( \mathcal{F} y(t) \)
b) The output of the filter is \( y(t) \)
(iii) \( y(t) = 0 \)
(iv) \( y(t) = (1/2)\cos(2\pi(50,000)t) \)
v) or none of the above
Circle the correct answer. [Hint: sketch \( X(f) \) and \( H(f) \)]

\( \mathcal{F} x(t) \)

\( \mathcal{F} x(t) \) has a bandwidth of 10 kHz. The signal \( x(t) \) is sampled at a rate of \( f_s \) to create a sampled signal \( x_s(t) \). To recover \( x(t) \) from \( x_s(t) \) the minimum value of \( f_s \) is:

a) \( f_s = 20 \) kHz
b) \( f_s = 10 \) kHz
c) \( f_s = 100 \) kHz
vi) or none of the above
Circle the correct answer.