Signals & Systems

Sampling Theorem and its Implications

Q.1 Explain Sampling process block diagram and steps of sampling.
Q.2 What is Nyquist theorem?
Q.3 Define the terms (i) Nyquist rate (ii) Nyquist interval (iii) Nyquist Samples (iv) Nyquist width
Q.4 Determine the (i) Nyquist rate (ii) Nyquist interval (iii) Nyquist width of the following signals
(a) $x(t) = Sin\ 100t$
(b) $x(t) = 2 + 3\cos 100\pi t + 2\sin 200\pi t$
(c) $x(t) = \frac{\sin 100\pi t}{\pi t}$
(d) $x(t) = (\sin 200\pi t)^2$
(e) $x(t) = sinc\ 2000\ \pi t$

Q.5 Consider a signal

$$x(t) = \cos 2000\pi t + 10\sin 10000\pi t + 20\cos 5000\pi t$$

Determine the (i) Nyquist rate (ii) Nyquist interval (iii) Nyquist width (iv) If sampling rate is 5000 samples per second, then determine the signal obtained after sampling.
Q.6 What do you mean by reconstruction of signals from sampled data?
Q.7 If one engineer has a sampled data x(nT). He wants to reconstruct his original signal using a reconstruction filter h(t). If h(t) is given by

$$h(t) = \begin{cases} 1 & for\ 0 \le t \le T \\ 0 & otherwise \end{cases}$$

Calculate the signal reconstructed using h(t).
Q.8 Explain reconstruction/interpolation using zero order hold. Derive transfer function for zero order hold.
Q.9 Explain reconstruction/interpolation using first order hold. Derive transfer function for first order hold.
Q.10 Explain reconstruction/interpolation using k^{th} order hold. Derive transfer function for first order hold.