CST Third Semester Midterm Examination, December 2020

Signals and Systems (CS-2104)

Answer all questions, which carry equal marks.

Try to answer to the point to restrict upload of pages.

Full Marks 30 Time 45 minutes

1. A square wave signal having amplitude of 1 volt and frequency of 100 Hz is passed through an integrator system. Sketch the waveform of the output signal with proper explanation. Two complete cycles are to be drawn.

2. Find the fundamental period of the following signals:
   A continuous signal given by: $x(t) = 2\sin(5t-1) - \cos(6t+1)$
   A discrete signal given by: $x[n] = 2 + e^{j\frac{2\pi n}{3}} - e^{j\frac{6\pi n}{7}}$

3. Consider a signal in frequency domain defined by the function
   $X(j\omega) = 1$ for $|\omega| < W$ and $X(j\omega) = 0$ for $|\omega| > W$.
   Describe the equation for the signal in time domain i.e. $x(t)$.
   What is the significance of the variable term W here?

4. The impulse response of a discrete system is given by $h[n] = (\frac{1}{3})^n u[n]$.
   What is the difference equation that describes the system?
   Is the system linear time invariant?

5. A speech signal, bandlimited to $10KHz$, is modulated using a carrier frequency of $1MHz$.
   Sketch the frequency spectrum of the resulting signal and explain.
   Arrive at the specifications of a low pass filter for demodulating this signal.
   What happens if carrier frequency is chosen to be $5KHz$?