Roll No.:.....

National Institute of Technology, Delhi

Mid Semester Examination (Autumn, 2022)

Branch	**: B.Tech (ECE, CSE, EE)**	**Semester**	**: III**
Title of the Course	**: Signal and Systems**	**Course Code**	**: ECB 204**
Time	**: 1.5 Hours**	**Maximum Marks**	**: 25**

All questions are compulsory.

- All questions should be answered in the same sequence as mentioned in the paper: You must answer Q1 first, then Q2, and so on. **ELSE QUESTIONS SHALL NOT BE EVALUATED.**

Q1. Sketch the following signals. **[5]**

I. Unit Impulse function
II. Unit step function
III. Unit ramp function
IV. Find y(t) for input

$$x(t)=\begin{cases}1, & t=1,2\\ -1, & t=-1,-2\\ 0, & t=0 \text{ and } |t|>2\end{cases} \quad ; y(t)= x(2t+3)$$

V. Evaluate the value of followings integral (where $\delta(t)$ is an impulse function) $\int_{-6}^{5}(t-2).\delta(2t-4)\,dt$

Q2. Determine the value of the average power of the even part of signal x(t). **[5]**

$$x(t)=3\cos(\frac{\pi t}{10})+3\sin(\frac{\pi t}{10})$$

Q3. Determine whether or not each of the following signals is periodic. If a signal is periodic, specify its fundamental Frequency and Time period. **[5]**

1. $4\cos(\pi t) + 3\sin(2\pi t)+2\sin(3\pi t)$.
2. $1+\cos^2(4\pi t)$.

Q4. Consider a continuous-time periodic signal x(t). **[5]**

$x(t) = 10\sum_{k=-\infty}^{\infty}\delta(t-5k)$ for k = 0, ±1, ±2, ..., ±∞.

Calculate exponential Continuous Time Fourier Series (CTFS) coefficients (c_k) for the above signal.

Q5 Let input to LTI system is x(t)=1 for 0≤t≤2, and its impulse response h(t)=2 for -2≤t≤2. Determine output y(t) of the LTI system for all t. **[5]**