Roll No.:.....

National Institute of Technology, Delhi

Name of the Examination: B. Tech. (Mid Sem Exam: March 2020)

Branch	**: B.Tech (ECE)**	**Semester**	**: VI**
Title of the Course	**: Digital Signal Processing**	**Course Code**	**: ECB 352**

Time: 1 Hour 30 Minuts **Maximum Marks: 25**

Note : All questions are compulsory.

Q1. Find circular convolution of two sequences using graphical method only. **[3 Marks]**

$x_1(n) = \{1,2,-1,-2,3,1\}, \quad x_2(n) = \{3,2,1\}$

Q2. Find the IDFT of $X(k) = \{4, -j2, 0, j2\}$ **[3 Marks]**

Q3. Find all possible inverse Z-transform using long division method. **[3 Marks]**

$$X(z) = \frac{z^2+z+2}{(z^3-2z^2+3z+4)}; \quad ROC; \ |z| < 1$$

Q4. **(a)** Check whether the system $y(n) = x(n) + \frac{1}{2x(n-2)}$ is linear or not. **[4 Marks]**

(b) Find the energy and power of the signal

$$x(n) = \sin\left(\frac{\pi}{3}n\right).$$

Q5. **(a)** Define causal and non causal systems. How we can predict whether the given system is stable or not? **[4 Marks]**

(b) Check whether the system is LTI systems or not.

$$y(n) = \begin{cases} x(n) = x(n-2) & for\ n \geq 0 \\ 0 & for\ n < 0 \end{cases}$$

Q6. Find the direct direct form-I and direct form-II realization of discrete-time system represented by the transfer function **[4 Marks]**

$$X(z) = \frac{3z^3 - 5z^2 + 9z - 3}{\left(z - \frac{1}{2}\right)\left(z^2 - z + \frac{1}{3}\right)}$$

Q7. Find the Z-Transform and ROC of the given discrete time signal. Also plot the ROC and pole-zero location. **[4 Marks]**

$$x(n) = 2\left(\frac{5}{6}\right)^n u(-n-1) + 3\left(\frac{1}{2}\right)^{2n} u(n)$$