National Institute of Technology, Delhi

Name of the Examination: B. Tech. (Mid Sem Exam: March 2022)

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

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

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. Find the DFT coefficient $X(k)$ at $k=2$ for the sequence $x(n) = \{4, 2, 3, 1\}$ **[4 Marks]**
using Goertzel algorithm.

Q6. Determine DFT of two real sequences using only one FFT flow graph. **[4 Marks]**
$x(n) = \{2, 3, 2, 1\}, y(n) = \{2, 1, 2, 1\}$. perform FFT only once.

Q7. Find the Z-Transform and ROC of the given discrete time signal. Also plot **[4 Marks]**
the ROC and pole-zero location.
$$x(n) = 2\left(\frac{5}{6}\right)^n u(-n-1) + 3\left(\frac{1}{2}\right)^{2n} u(n)$$