

**PARUL UNIVERSITY**  
**FACULTY OF ENGINEERING & TECHNOLOGY**  
**B.Tech. Summer 2021 - 22 Examination**

**Semester: 8**  
**Subject Code: 203106487**  
**Subject Name: Digital Signal Processing**

**Date: 30/03/2022**  
**Time: 10.30 am to 1.00 pm**  
**Total Marks: 60**

**Instructions:**

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

**Q.1 Objective Type Questions - (Each of one mark) (15)**

1. As per Sampling Theorem,  $f_s$  \_\_\_\_\_  $2f_m$ . ( $\geq / \leq$ )
2. While Design IIR Filter with the help of Direct Method II require \_\_\_\_\_ memory then Direct method I (more/less)
3. If  $x(n)$  is non-causal signal then ROC of its ZT is \_\_\_\_\_ part of the circle of radius say 'a'. (Interior / Exterior)
4. While drawing Direct form I, \_\_\_\_\_ system connected first. (All Pole / All Zero)
5. Inverse Z-Transform of  $z^{-8}$  is \_\_\_\_\_
6. Nyquist Rate of signal  $y(t) = 2 \sin(440\pi t)$  is \_\_\_\_\_
7. IZT of  $X(z) = \frac{z}{z+5}$  is \_\_\_\_\_
8. Output of DFT is \_\_\_\_\_ signal (CT / DT)
9. Roc of Z-Transform of  $x(n) = \{1, 2, 9, 5, 0, 7\}$  is Entire Z Plane except  $z =$  \_\_\_\_\_
10. In 4 Point DFT \_\_\_\_\_ is the value of  $X(2)$  if  $X(4) = -6-6j$ .
11. If the Signal is \_\_\_\_\_, then it's possible to recover perfect CT signal from DT signal.

- |                      |                     |
|----------------------|---------------------|
| A) Non-Band Limited  | B) Band Limited     |
| C) Pass-Band Limited | D) All of the above |

12. In 8- Point DFT  $W_8^0 = W_8^8$

- A) True                      B) False

13. If  $X(z)$  is the z-transform of the signal  $x(n)$ , then what is the z-transform of the signal  $x(-n)$ ?

- A)  $X(z^{-1})$               B)  $X(-z)$               C)  $X^{-1}(z)$               D) None of the mentioned

14. If 4-Point DFT  $X(k) = \{4, 4-j, -4, 4+j\}$ , then \_\_\_\_\_ is the value of  $x(0)$  in DT Signal.

- A) 1                      B) 2                      C) -1                      D) 0

15. IZT of  $\frac{2}{z-1}$  is \_\_\_\_\_

- A)  $2u(n-1)$               B)  $2u(n)$               C)  $u(n+1)$               D)  $-u(n)$

**Q.2 Answer the following questions. (Attempt any three) (15)**

A) Determine Z-Transform of following

i)  $x_1(n) = \delta(n-k)$

ii)  $x_2(n) = \delta(n+k)$

iii)  $x_3(n) = u(-n)$

B)

$$x(n) = \{1, 1, 0, 1, 1\}$$

$$h(n) = \{1, -2, -3, 4\}$$

find...y(n)

By using Tabulation method of convolution

C) Compute DFT Sequence  $x(n) = \{0, 1, 2, 3\}$

D) Use Partial Fraction Method find IZT

$$X[z] = \frac{5z}{[z-1][z-3]}$$

**Q.3** A) Determine ZT of given equation and draw ROC also. (07)

$$x[n] = (1/3)^n u[n] - (1/2)^n u[-n-1]$$

B) Obtain parallel form realization of following IIR filter (08)

$$H(z) = \frac{3z(5z-2)}{(z+1/2)(3z-1)}$$

**OR**

B) Determine IDFT of  $X[k] = \{2, 1+j, 0, 1-j\}$  using matrix method. (08)

**Q.4** A) A Difference Equation of current is given below: (07)

$$y(n) = 0.5y(n-1) + x(n)$$

Determine:

- a) System Transfer H(z)
- b) Draw Pole Zero Plot
- c) Unit Impulse Response h(n)

**OR**

A) Using radix 2 FFT algorithm, plot flow graph for N=8 (Decimation in Frequency) (07)

B) Determine Direct form II realization for following LTI system. (08)

$$2y(n) + y(n-1) - 4y(n-3) = x(n) + 3x(n-1)$$