



# MAULANA ABUL KALAM AZAD UNIVERSITY OF TECHNOLOGY, WEST BENGAL

Paper Code : PC-EEE-801 Digital signal processing

UPID : 008318

Time Allotted : 3 Hours

Full Marks : 70

The Figures in the margin indicate full marks.

Candidate are required to give their answers in their own words as far as practicable

## Group-A (Very Short Answer Type Question)

1. Answer any ten of the following : [ 1 x 10 = 10 ]
- (I) Appending zeros to a sequence in order to increase its length is called \_\_\_\_\_.
  - (II) What are the various basic methods of sampling rate conversion in digital domain?
  - (III) Write the full form of MMSE.
  - (IV) What is an Energy Signal?
  - (V) What is another term used for two-sided Z-transform?
  - (VI) In DFT computation using radix-2 FFT, the value of N should be such that \_\_\_\_\_.
  - (VII) State the convolution property of Z transform.
  - (VIII) The convolution by FFT is called \_\_\_\_\_.
  - (IX) The phenomena of high frequency components acquiring the identity of low frequency components is called \_\_\_\_\_.
  - (X) What is stationary process?
  - (XI) A discrete time system is \_\_\_\_\_ if its input-output relationship do not change with time.
  - (XII) The inverse Z-transform of transfer function is \_\_\_\_\_ of the system.

## Group-B (Short Answer Type Question)

Answer any three of the following : [ 5 x 3 = 15 ]

2. What is Discrete Time Systems? [ 5 ]  
Write the Various classifications of Discrete-Time systems.
3. State and prove the time shifting property of Z transform. [ 5 ]
4. Briefly discuss on the representation methods of discrete time signals. [ 5 ]
5. State and prove the convolution property of Z transform. [ 5 ]
6. Perform the correlation of the two sequences,  $x(n)=\{1,2,3\}$  and  $y(n)=\{2,4,1\}$ . [ 5 ]

## Group-C (Long Answer Type Question)

Answer any three of the following : [ 15 x 3 = 45 ]

7. (a) What are all the properties of ROC of Discrete Time Signals? [ 8 ]  
(b) State and prove Final Value theorem of Z-transform. [ 7 ]
8. (a) Calculate the DFT of the sequence,  $x(n)=\{1,1,-2,-2\}$  [ 4 ]  
(b) Compare the DIT and DIF radix- 2 FFT. [ 5 ]  
(c) Compute 4-point DFT of causal three sample sequence given by, [ 6 ]  
 $x(n)=1/3 ; 0 \leq n \leq 2$   
 $= 0 ; \text{ else}$
9. (a) Find the Z-transform of the discrete time signal generated by mathematically sampling the [ 5 ]  
following continuous signal  $\cos \Omega_0 t$ .  
(b) Determine the inverse Z transform of the following Z domain function [ 6 ]

$$X(Z) = \frac{(2z - 4)}{((z - 1))(z + 2)^2}$$

- (c) Determine the Z transform of  $x(n)=(n-3)u(n)$ . [ 4 ]
10. (a) Compare the overlap add and overlap save methods of sectioned convolution. [ 5 ]  
(b) Compute the circular convolution of two sequences,  $x_1(n)=\{0,1,0,1\}$ , and  $x_2(n)=\{1,2,1,2\}$  using DFT. [ 7 ]

(c) Perform the circular convolution of the two sequences  $x_1(n)=\{1,2,3\}$  and  $x_2(n)=\{4,5,6\}$ . [ 3 ]

11. (a) Find the DFT of the sequence  $x(n)=\{1,1,0,0\}$ . [ 5 ]

(b) Find the 8-point DFT of the sequence  $x(n)=\{0,1,2,3,4,5,6,7\}$ , using DIF, radix-2, FFT algorithm. [ 5 ]

(c) Find the IDFT of the sequence  $X(k)=\{10,-2+2j,-2,-2-2j\}$ . [ 5 ]

\*\*\* END OF PAPER \*\*\*