ADAMAS UNIVERSITY PURSUE EXCELLENCE	**ADAMAS UNIVERSITY** **END-SEMESTER EXAMINATION : MAY 2021** (Academic Session: 2020 – 21)		
Name of the Program: (Example: B. Sc./BBA/MA/B.Tech.)	B. Tech ECE	**Semester:** (I/III/ V/ VII/IX)	IV
Paper Title :	DIGITAL SIGNAL PROCESSING	**Paper Code:**	EEC42106
Maximum Marks :	40	**Time duration:**	3 Hours
Total No of questions:	8	**Total No of Pages:**	2
(Any other information for the student may be mentioned here)			

Answer all the Groups

Group A

Answer all the questions of the following $5 \times 1 = 5$

1.

(i) What is causal system? A system with an input x(n) and output y(n) is described by a relation: y(n) = 3x(n)+1, this system is linear or not.

(ii) The system represented as $H(Z) = 6 + 5Z^{-1} + Z^{-2}$, is a minimum phase, maximum phase or mix phase system?

(iii) The impulse response of a discrete time-invariant system is $h(n) = 6^n u(-n-1)$ then find the system function H(z)

(iv) If the impulse response of a discrete time system is $h(n) = \{1, 3, 5, 2, -1\}$, then what will be the system impulse response $h_1(n) = h((n-2))_6$

(v) Consider the signal $x(t) = \cos(3\Pi t) + \cos(2\Pi t)$ where t is in second. Find the Nyquist sampling rate for signal $y(t) = x(2t+5)$

Group B

(Answer any three questions)

$3 \times 5 = 15$

2. Consider a FIR filter with system transfer function [3+1+1=5]

$$H(Z) = 1 + 2z^{-1} - 2z^{-2} + 1.6z^{-3} + 2z^{-4} - 2z^{-5} + z^{-6}$$

(i) Sketch direct form of realization
(ii) Find input and output relation
(iii) Determine, FIR system is linear phase or not

3.

a) Calculate the number of multiplication and addition of 16-point radix 2 FFT algorithms.
b) Write the FFT algorithm of divide and conquer approach [2+3=5]

4.
a) What is radix 2 in FFT algorithm? [1+4=5]
b) Sketch the butterfly structure of 8-point radix 2 FFT algorithm for decimation in time.

5. Find the DFT of $x_1(n) = \{1, 2, 3, 4\}$ using matrix multiplication ` [5]

Group C

(Answer any two questions)

$2 \times 10 = 20$

6.
a) What is linear phase system [1+4+4+1=10]
b) Consider an IIR filter with system transfer function

$$H(\mathrm{Z}) = \frac{1+1.2z^{-1}-2z^{-2}+1.8z^{-3}+0.8z^{-4}}{1+2z^{-1}+1.5z^{-2}-1.2z^{-3}}$$

(i) Sketch direct form I of realization
(ii) Sketch direct form II of realization
(iii) Find input and output relation

7.
a) Define DFT and IDFT [2+4+4=10]
b) Find and draw the frequency spectrum of the following signal

$$x(n) = \begin{cases} 1, & 0 \le n \le L-1 \\ 0, & \text{otherwise} \end{cases}$$

c) Find the circular convolution of $x_1(n) = \{1, 1, 3, 5, 5\}$ and $x_2(n) = \{3, 2, 1, 2, 3\}$

8.
a) Find the number of stages in 64-point radix 2 FFT algorithms. [1+4+5=10]
b) Sketch the butterfly structure of 8-point radix 2 FFT algorithm for decimation in frequency.
c) Find the impulse response h(n) and ROC of the system $H(\mathrm{Z}) = \frac{3-4Z^{-1}}{1-3.5Z^{-1}+1.5Z^{-2}}$

for the following condition
i) System is stable
ii) System is causal
iii) System is anti-causal