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GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fifth Semester – Regular) Examinations, December – 2022

BPCEC5030 – Digital Signal Processing

(ECE)

Time: 3 hrs

Maximum: 70 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)

(1 x 10 = 10 Marks)

<u>Q.1. Answer ALL questions</u>	CO #	PO #
a. DFT is applicable to	1	1
i. Infinite sequences		
ii. Finite discrete sequences		
iii. Continuous infinite signals		
iv. Continuous finite sequences		
b. The circular convolution of two sequences in time domain is equivalent to	1	1
i. Multiplication of DFTs of two sequences		
ii. Summation of DFT sequences		
iii. Difference of DFTs of two sequences		
iv. Square of multiplication of DFTs of two sequences		
c. The interface between an analog signal and a digital processor is	1	1
i. D/A converter		
ii. A/D converter		
iii. Modulator		
iv. Demodulator		
d. If M and N are the orders of numerator and denominator of rational system function respectively, then how many multiplications are required in direct form-I realization of that IIR filter?	4	1
i. M+N-1		
ii. M+N		
iii. M+N+1		
iv. M+N+2		
e. Given that $W = e^{-i\left(\frac{2\pi}{N}\right)}$, where $N = 3$. Then $F = W^N$ can be computed as $F =$	2	2
i. 0		
ii. 1		
iii. -1		
iv. e		
f. How many complex additions are required to be performed in linear filtering of a sequence using FFT algorithm?	2	1
i. $(N/2)\log N$		
ii. $2N\log_2 N$		
iii. $(N/2)\log_2 N$		
iv. $N\log_2 N$		
g. A filter is said to be linear phase filter if the phase delay and group delay are	3	1
i. High		
ii. Moderate		
iii. Low		
iv. Constant		
h. What is the duration of the unit sample response of an IIR filter?	4	1
i. Finite		
ii. Infinite		
iii. Impulse (very small)		
iv. Zero		
i. Which of the following methods are used to convert analog filter into digital filter?	4	1
i. Approximation of Derivatives		
ii. Bilinear transformation		
iii. Impulse invariance		
iv. All of the mentioned		
j. Which of the following is the correct relation between ω and Ω ?	4	1
i. $\Omega = \omega T$		
ii. $T = \Omega \omega$		
iii. $\omega = \Omega T$		
iv. None of the mentioned		

PART – B: (Short Answer Questions)**(2 x 10 = 20 Marks)**

Q2. Answer ALL questions	CO #	PO #
a What are the properties of twiddle factor	1	1
b Find the DFT of $x(n)=\{1,-5\}$	1	2
c What is complex conjugate property?	1	1
d Draw the DF of 1st order Digital filter	4	1
e What is principle of radix FFT algorithm?	2	1
f. What is SIF of 64-point DFT?	2	2
g What is transposition theorem?	4	1
h What are the advantages and disadvantages of FIR Filters?	3	1
i. What is warping effect?	4	1
j. What is the need of system function in structure?	3	1

PART – C: (Long Answer Questions)**(10 x 4 = 40 Marks)**

Answer <u>ALL</u> questions	Marks	CO #	PO #
3.a. Find the circular convolution using matrix method if $a(n) = \{1, -2, 3, 4\}$ and $b(n) = \{2, -4, 6, -8, 2\}$.	5	1	2
b. Find the 4-point DFT of $x(n) = \{1, -5, 6, 7\}$.	5	1	2
(OR)			
c. Find the linear convolution using overlap save method if $x(n) = \{1, 2, 3, -5, 4, 2, 3, 3, 1, 2\}$ and $h(n) = \{1, 2, -2\}$.	10	1	2
4.a. Draw and explain the basic butterfly diagram of DIT-FFT algorithm.	10	2	1
(OR)			
b. Find the 8-point DFT using DIF-FFT algorithm if $x(n)=\{1,-2,5,3,-1,4,2\}$	10	2	2
5.a. Design a FIR filter using Hamming window of length 7 if the desired frequency response is $H_d(\omega) = \begin{cases} e^{-j2\omega} & \text{for } -\frac{\pi}{4} \leq \omega \leq \frac{\pi}{4} \\ 0 & \text{Otherwise} \end{cases}$	10	3	2
(OR)			
b. Design a FIR filter using frequency sampling of length 7 if the desired frequency response is $H_d(\omega) = \begin{cases} e^{-j2\omega} & \text{for } -\frac{\pi}{2} \leq \omega \leq \frac{\pi}{2} \\ 0 & \text{Otherwise} \end{cases}$	10	3	2
6.a. Establish the relationship between ω and Ω in bilinear transformation method?	5	4	2
b. Design a digital IIR filter using impulse invariant method of sampling period 1 second and the system function is $H(s) = \frac{5}{(s+2)(s+3)}$	5	4	2
(OR)			
c. Consider the casual system $y(n) = -0.5y(n-1) - 0.12y(n-2) + 0.7x(n) - 0.252x(n-2)$ Obtain DF-I, DF-II & Parallel form structure of the system	10	4	2

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