GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fifth Semester Regular) Examinations, December – 2023

21BECPC35003 – Digital Signal Processing

(ECE)

Time: 3 hrs Maximum: 70 Marks

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

Q.1. Answer ***ALL*** questions	CO #	Blooms Level
a. Find the value of x $((n-753))_4$ if x(n) = {1,2, -2,4}.	CO1	K2
b. What is Convolution property?	CO1	K1
c. How many multiplications and additions are required for 32-point DFT?	CO2	K1
d. Why linear phase FIR filters are also called as constant delay filters?	CO3	K1
e. Draw the basic structure of 1st order digital IIR filter.	CO4	K2

PART – B **(15 x 4 = 60 Marks)**

Answer ***ALL*** questions	Marks	CO #	Blooms Level
2. a. The DFT of $x(n)$ is described as X(K)={0,-1-i,6,-1+i}. Find the DFT of $x^2(n)$	15	CO1	K3
(OR)			
b. Calculate the linear convolution using Overlap Save method if x(n)={1,2,3,4,4,3,2,1,0,5} & h(n)={1,-3,4}?	15	CO1	K3
3.a. Find the 8-point DFT using DIF-FFT algorithm if x(n) = {1, -2,2,3, -1,4}.	15	CO2	K3
(OR)			
b. Find the DFT of the given signals using 4-point DFT if g(n)={1,2,0,1} and h(n)={2,2,1,1} .	15	CO2	K3
4.a. Design a FIR filter using frequency sampling of length 7 if the desired frequency response is $H_d(\omega) = e^{-j2\omega}$ for $-\pi/2 \leq \omega \leq \pi/2$ $= 0$ Otherwise	15	CO3	K3
(OR)			
b. Determine the coefficient of linear phase FIR filter length M=15, which has a symmetric unit sample response and frequency response that satisfies the condition	15	CO3	K3

$$\text{Hr}\left(\frac{2\pi K}{15}\right) = 1 \qquad K = 0, 1, 2, 3$$

$$= 0.4 \qquad K = 4$$

$$= 0 \qquad K = 5, 6, 7$$

5.a. If $H(z) = \frac{3+3.6z^{-1}+0.6z^{-2}}{1+.01z^{-1}-0.2z^{-2}}$ then draw the Parallel form structure using 1st order and 2nd order transfer function — 15 CO4 K3

(OR)

b. Design a digital IIR filter using impulse invariant method and the system function is

$$H(s) = \frac{3}{(s+1)(s-5)}$$

7 CO4 K3

c. Convert the analog filter with system function

$$H(s) = \frac{s+0.1}{(s+0.1)^2+9}$$

into a digital IIR filter using impulse invariance transformation method. The digital filter is to have resonant frequency of $\pi/2$. — 8 CO4 K3

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