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**BTECH**  
**(SEM V) THEORY EXAMINATION 2024-25**  
**DIGITAL SIGNAL PROCESSING**

TIME: 3 HRS

M.MARKS: 100

**Note:** Attempt all Sections. In case of any missing data; choose suitably.

## SECTION A

**1. Attempt all questions in brief. 2 x 10 = 20**

Q no.	Question	CO	Level
a.	What are the basic elements of a digital signal processing system?	1	K1
b.	What is the difference between canonic and non-canonic structures?	1	K2
c.	List the properties of Chebyshev filters.	2	K1
d.	What is the impulse invariant transformation?	2	K1
e.	Describe the difference between truncation and rounding quantization.	3	K2
f.	Why does the Kaiser window offer flexibility in FIR filter design?	3	K2
g.	Define circular convolution.	4	K1
h.	What is the Decimation in Time (DIT) algorithm?	4	K2
i.	List the advantages of multirate DSP	5	K1
j.	Why is subband coding important in speech processing?	5	K2

## SECTION B

**2. Attempt any three of the following: 10 x 3 = 30**

a.	List and explain the different types of structures used to represent digital systems.	1	K1
b.	How a digital filter is designed from analog filter?	2	K2
c.	Using a rectangular window technique design a low pass filter with passband gain of unity, cut-off frequency of 1000 Hz and working at a sampling frequency of 5 kHz. The length of the impulse response should be 7.	3	K3
d.	Explain the Decimation in Time (DIT) and Decimation in Frequency (DIF) algorithms for FFT	4	K2
e.	Explain decimation and interpolation in multirate DSP.	5	K1

## SECTION C

**3. Attempt any one part of the following: 10 x 1 = 10**

a.	Obtain the parallel form realization $H(z) = \frac{(1 + 1/2z^{-1})}{(1 - z^{-1} + 1/4z^{-2})(1 - z^{-1} + 1/2z^{-2})}$	1	K3
b.	Obtain the direct form I, direct form II form realization for the following system: $y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$	1	K3

**4. Attempt any one part of the following: 10 x 1 = 10**

a.	Explain impulse invariant transformation and bilinear transformation.	2	K2
b.	Explain the designing of low pass Butterworth filter	2	K2



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**5. Attempt any one part of the following: 10 x 1 = 10**

a.	What is Gibb's phenomenon? Explain its significance in FIR filter design.	3	K1
b.	Discuss the differences between Hamming and Blackman windows.	3	K2

**6. Attempt any one part of the following: 10 x 1 = 10**

a.	Find the 8 point DFT of the sequence $x(n) = \{1, 1, 1, 1, 1, 0, 0, 0\}$ using DIT FFT.	4	K3
b.	Compute the circular convolution of two discrete time sequences $x_1(n) = \{1, 2, 1, 2\}$ and $x_2(n) = \{3, 2, 1, 4\}$ .	4	K3

**7. Attempt any one part of the following: 10 x 1 = 10**

a.	Discuss about interpolation and sampling rate conversion in detail.	5	K2
b.	Describe linear interpolation method	5	K2

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