BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(END SEMESTER EXAMINATION)

CLASS: MTECH **SEMESTER : I**
BRANCH: EEE **SESSION : MO/2023**

SUBJECT: EE501 ADVANCED DIGITAL SIGNAL PROCESSING

TIME: 3 Hours **FULL MARKS: 50**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 10 marks and total 50 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Before attempting the question paper, be sure that you have got the correct question paper.**
5. Tables/Data hand book/Graph paper etc. to be supplied to the candidates in the examination hall.

			CO	BL
Q.1(a)	A casual system is represented by the following difference equation. $y(n)+0.25y(n-1)= x(n)+0.5\ x(n-1)$ Find the system transfer function H(z) and the impulse response of system.	[5]	CO-1	BL-2
Q.1(b)	Obtain the direct form I and II structure for the following system: $y(n)= 10\ y(n-1)+13\ y(n-4)-12\ x(n-1)+5x(n-2)$	[5]	CO-1	BL-3
Q.2(a)	The system function of the analog filter is given as $H(S)=1\ /\ (S+0.5)\ (S^2 + 0.5S+2)$ Obtain the system function and realization of the IIR digital filter by using impulse invariant transformation.	[5]	CO-2	BL-3
Q.2(b)	Design a linear phase FIR lowpass filter using hamming window by taking 7 samples of window sequence and with a cutoff frequency of 1 rad/sample.	[5]	CO-1	BL-4
Q.3(a)	Considered the discrete time signal, x(n)= { 1,3,5,7,9,11}. Determine the output signal for (a) Sampling rate reduction factors of D=2 and D=3. (b) Sampling rate multiplication factor of I=2 and I=3.	[5]	CO-3	BL-3
Q.3(b)	Considered a spectrum of input signal $X(e^{jw})$ with bandwidth of - pi to + pi. Sketch the spectrum of original and down sampled signal for sampling rate reduction factor D=2 and D=3.	[5]	CO-3	BL-4
Q.4(a)	Write short notes on (i) System Identification (ii) Channel Equalization using adaptive system.	[5]	CO-4	BL-3
Q.4(b)	Explain adaptive system. What are properties of adaptive system. Explain how any adaptive systems can be implemented for prediction of any time series data.	[5]	CO-4	BL-3
Q.5(a)	Explain different type of architecture used for DSP processor with their advantages and disadvantages ?	[5]	CO-5	BL-4
Q.5(b)	Given a sequence x(n)={1,2,3,4,4,3,2,1}, determine Discrete Fourier Transform of x(n) using Decimation in Time-Fast Fourier Transform algorithm. Find the percentage improvement in multiplication using digital hardware.	[5]	CO-5	BL-5

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