BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP/2025)

CLASS: BTECH **SEMESTER : IV/ADD**
BRANCH: EEE **SESSION : SP/2025**

SUBJECT: EE305 DIGITAL SIGNAL PROCESSING

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Determine if the systems (i) y(n)= n.x(n) and (ii) y(n) =x(n)-x(n-1) are time variant or time invariant.	[2]	CO-1	BL-1
Q.1(b)	Determine the output y(n) of a relaxed linear time-invariant system with impulse response h(n)= a^n u(n), a<1, when the input is a unit step sequence, i.e. x(n)= u(n).	[3]	CO-1	BL-3
Q.2(a)	Test the stability of LTI systems, whose impulse responses are (i) $h(n) = 0.2^n u(n)$ (ii) $h(n) = 0.2^n u(-n) + 3^n u(-n)$	[2]	CO-1	BL-2
Q.2(b)	Obtain the direct form-II structure for the following system: $y(n) = 3b^4 \cos\omega_0\, y(n-1) - 2b^9 y(n-2) + 2x(n) - 6b\cos\omega_0\, x(n-1)$.	[3]	CO-1	BL-3
Q.3(a)	Determine H(Z), and its poles and zeros if $y(n) + \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + x(n-1)$	[2]	CO-2	BL-3
Q.3(b)	A casual system is represented by the following difference equation. $y(n) + \frac{1}{4}y(n-1) = x(n) + \frac{1}{2}x(n-1)$.Find the system transfer function H(z), the impulse response of system.	[3]	CO-2	BL-3
Q.4(a)	Determine the Z-Transform of the signal h(n)= n.a^n u(n), -1<a<1	[2]	CO-2	BL-2
Q.4(b)	Using long division method, determine the inverse Z-transform of $X(z) = \frac{1}{1+\frac{5}{2}z^{-1}+2z^{-2}}$, when $ROC: \lvert z\rvert > 1$.	[3]	CO-2	BL-3
Q.5(a)	Given a sequence $x(n) = \{1, 1, 0, 0\}$, determine the discrete Fourier transform $X(K)$.	[2]	CO-3	BL-2
Q.5(b)	Determine the IDFT of X(K) ={ 3, 2+j , 1, 2-j }.	[3]	CO-3	BL-3

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