BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

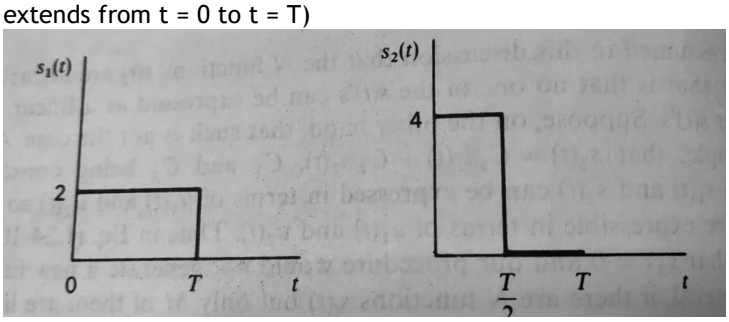
CLASS: BTECH **SEMESTER : VI**
BRANCH: ECE **SESSION : SP2023**

SUBJECT: EC353N DIGITAL COMMUNICATION

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)	State the low-pass sampling theorem and briefly explain its significance	[2]	CO1	1,2
Q.1(b)	The signal $x(t) = 2\cos 200\pi t + 6\cos 180\pi t$ is ideally sampled at a frequency of 150 samples per second. The sampled version $x_\delta(t)$ is passed through a unit gain ideal LPF with a cut-off frequency of 110 Hz. What frequency components will be present in the output of the LPF?	[3]	CO1	2,3
Q.2(a)	A PCM system uses a step size of Δ. If the quantization error is uniformly distributed, determine the mean-square value of the quantization error.	[2]	CO1	5
Q.2(b)	A Delta modulator transmitter with a fixed step of 0.5 V, is given a sinusoidal message signal. If the sampling frequency is twenty times the Nyquist rate, determine (i) the maximum permissible amplitude of the message signal, if slope overload is to be avoided, and (ii) the maximum destination SNR under the above condition.	[3]	CO1	4,5
Q.3(a)	What is matched filter? Represent it in the form of a block diagram in the presence of noise.	[2]	CO1	2,3
Q.3(b)	Let $g(t) = p(t) * p(t)$, where * denotes convolution and $p(t) = u(t) - u(t-1)$ with $u(t)$ being the step function. Determine the impulse response of the filter matched to the signal $s(t) = g(t) - \delta(t-2) * g(t)$	[3]	CO2	3,4
Q.4(a)	What is an 'integrate-and-dump' circuit?	[2]	CO2	1,2
Q.4(b)	Two functions $s_1(t)$ and $s_2(t)$ are shown in the below figure. Use Gram-Schmidt procedure to express these functions in terms of orthonormal components. (Interval of interests extends from t = 0 to t = T)	[3]	CO2	3,4
Q.5(a)	Explain Amplitude Shift Keying in brief. Why is ASK not preferred?	[2]	CO2	2
Q.5(b)	How is BPSK generated? Explain in brief	[3]	CO2	3,4



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