JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

MOOC End Term Examination - 2025

B.Tech-VII Semester (ECE)

COURSE CODE(CREDITS): 25B2WEC605 MAX. MARKS: 70

COURSE NAME: ANALOG COMMUNICATION

COURSE INSTRUCTORS: Dr. Alok Kumar / Dr. Shweta Pandit MAX. TIME: 3 Hours

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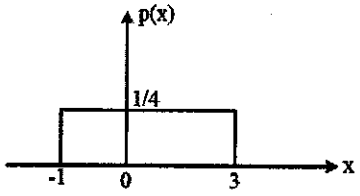
Note: *(a)All questions are compulsory.*

(b)Marks are indicated against each question in square brackets.

(c) The candidate is allowed to make Suitable numeric assumptions wherever required for solving problems

(d) Use of a scientific calculator is permitted during the exam.

Q.No	Question	Marks
Q1	a) Define a random process and wide-sense stationarity (WSS)?	[4]
	b) For a random variable 'X' following the probability density function, p(x), as shown in below figure, find the mean and the variance of the random variable 'X'. 	[6]
Q2	a) Explain the Sampling Theorem with proof using frequency-domain analysis.	[4]
	b) Discuss the effects of under-sampling with diagrams and examples.	[3]
	c) Message signal having lower frequency is 4.4 MHz and higher frequency is 5.6 MHz, compute the minimum sampling frequency.	[3]
Q3	a) Discuss the effect of noise on received SNR in conventional AM and compare it with baseband system.	[5]
	b) A 1 mW video signal having a bandwidth of 100 MHz is transmitted to a receiver through a cable that has 40 dB loss. If the effective one-sided noise spectral density at the receiver is 10^{-20} Watt/Hz, then compute the signal-to-noise ratio at the receiver.	[5]
Q4	a) Why pre-emphasis and de-emphasis are required in FM system? Discuss in detail with suitable diagram.	[5]
	b) An FM wave is given by: $S(t) = 20\cos\left(8\pi 10^6 t + 9\sin\left(2\pi 10^3 t\right)\right)$ Calculate the I. Frequency deviation, II. Bandwidth, and III. Power of FM wave.	[5]

Q5	a) What is Hilbert transform? Draw and explain the block diagram of the Hilbert Transform method for generating SSB-SC. b) A message signal m(t) = 10cos(2π200t). Generate USB and LSB signals using Hilbert method. The carrier frequency is assumed to be 100 KHz.	[6] [4]
Q6	a) Explain the principle of quantization and obtain the expression for the signal to quantization noise ratio. b) Design a digital communication system using PCM system, so as to achieve a signal to quantization noise ratio of at least 40 dB for an analog signal of S(t) = 3cos(1000πt).	[5] [5]
Q7	Why PSD is used for random processes? What is the difference between periodic, aperiodic, and random signals in terms of PSD? Write the relationship between autocorrelation and power spectral density (PSD).	[10]