JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION- 2024

B.Tech- VII Semester (CSE/IT/CE/BI/BT)

COURSE CODE (CREDITS): 18B1WEC635 (2)   MAX. MARKS: 35

COURSE NAME: Principles of Communication Systems

COURSE INSTRUCTORS: Dr. Alok Kumar   MAX. TIME: 2 Hour

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

(b) The candidate is allowed to make Suitable numeric assumptions wherever required

for solving problems

Q.No	Question	CO	Marks
Q1	A. State and explain the Sampling Theorem. B. What is the Nyquist rate? C. Why is aliasing caused, and how can it be avoided? D. Discuss the role of anti-aliasing filters in the sampling process. E. A 10 kHz band-limited signal is sampled at 15 kHz. Is aliasing present? Justify your answer.	CO-4	5
Q2	What is multiplexing? Why is it used in communication systems? Differentiate between Frequency Division Multiplexing (FDM) and Time Division Multiplexing (TDM). A signal is transmitted using FDM with a guard band of 2 kHz between adjacent channels. If there are 10 signals, each with a bandwidth of 4 kHz, calculate the total bandwidth required.	CO-3	5
Q.3	Prove that the sampling frequency must be at least twice the maximum frequency of the signal for perfect reconstruction. If a signal is sampled at 8 kHz and reconstructed using a low-pass filter, what is the maximum frequency of the signal that can be accurately reconstructed?	CO-4	5
Q.4	What are the key differences between analog and digital modulation techniques? Describe the process of generating PWM signals using a modulating waveform. Illustrate the waveforms of PAM, PWM, and PPM for the same input signal.	CO-2, CO-3	5
Q.5	Draw and explain the working principle of heterodyne receiver with the help of block diagram. Discuss the practical applications of heterodyne receivers in communication systems. Why are heterodyne receivers widely used in radio and television systems? If the intermediate frequency (IF) is 455 kHz and the received frequency is 1 MHz, calculate the local oscillator frequency.	CO-2	5
Q.6	Explain the steps involved in PCM, including sampling, quantization, and encoding. Calculate the bit rate of a PCM system for a signal bandwidth of 4 kHz, sampled at 8 kHz, and quantized using 8 bits per sample.	CO-5	5

| Q.7 | Design a delta modulator for a given input signal and explain the criteria for choosing the sampling rate and step size. If the signal changes faster than the modulator can track, describe the type of error and propose a solution. | CO-5 | 5 |