JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -2 EXAMINATION- 2024

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

COURSE CODE (CREDITS): 18B1WEC635 (2) MAX. MARKS: 25

COURSE NAME: Principles of Communication Systems

COURSE INSTRUCTORS: Dr. Alok Kumar MAX. TIME: 1 Hour 30 Minutes

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	Differentiate between narrowband FM and wide band FM communication system with help of mathematical and graphical analysis. What is the similarity between Narrow band FM system and Amplitude modulated system?	CO-2, CO-3	4
Q2	Draw and describe the components of an envelope detector circuit used for demodulating an AM signal. Given an AM signal $X(t) = [1 + 0.5Cos(2\pi f_m t)]Cos(2\pi f_c t)$, Design an envelope detector circuit and calculate the values of R and C to ensure the envelope is properly detected if $f_c = 100$ KHz , and f_m=1 KHz.	CO-2	4
Q.3	A modulating signal given by x(t)=7Sin($4\pi 10^3 t - 10\pi Cos(2\pi 10^3 t)$) is fed to a phase modulator with phase deviation constant K_p=15 rad/V. If the carrier frequency is 20 KHz, find the instantaneous frequency at t=0.5 ms.	CO-2	3
Q.4	What is the modulation index in FM? Derive its expression and explain its significance? An FM signal has a bandwidth of 200 kHz and is modulated by a signal with a frequency of 5 kHz. Calculate the modulation index.	CO-2	3
Q.5	a) A signal is amplitude modulated with a modulation index of 0.6. Calculate the efficiency of the transmission. b) A carrier has a power of 200 W, and the modulation index is 0.5. Calculate the power in the upper sideband (USB) and lower sideband (LSB).	CO-2	3
Q.6	What is Carson's rule, and how is it used to calculate the bandwidth of an FM signal? A carrier frequency of 95 MHz is modulated by a 15 kHz audio signal. The maximum frequency deviation is 75 kHz. Calculate the bandwidth of the FM signal using Carson's Rule.	CO-2	3

Q.7	Derive the mathematical expression for the synchronous demodulation of a DSB-SC signal. How the original message signal is recovered?	CO-1, CO-2	3
Q.8	A 5 kW carrier is amplitude modulated by three sinusoidal signals with modulation indices of 0.4, 0.3, and 0.2, respectively. Calculate the total transmitted power.	CO-1, CO-2	2