JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -1 EXAMINATION- 2026

B.Tech - IV Semester (ECE/VLSI/ECE MINOR)

COURSE CODE (CREDITS): ~~25B11EC411~~/25B11EC417 (4)　　　　MAX. MARKS: 15

COURSE NAME: Analog and Digital Communication

COURSE INSTRUCTOR: Dr. Alok Kumar　　　　MAX. TIME: 1 Hour

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

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

(c) Use of calculators is allowed

Q.No	Question	CO	Marks
Q1	With the help of a neat block diagram, explain the generation of an AM signal using a non-linear device. Show that the output contains the carrier and sideband frequencies.	1	3
Q2	**a)** Derived the expression for an amplitude modulated (AM) wave considering the message and carrier signals as follows: $m_1(t) = A_{m1}Cos(\omega_{m1}t)$, $m_2(t) = A_{m2}Cos(\omega_{m1}t)$ and $C(t) = A_cCos(\omega_c t)$. Where, $m_1(t)$ and $m_2(t)$ are the message signals, and $C(t)$ is the carrier signal.	1	2
	b) Draw the frequency spectrum of the modulated wave in part (a) by considering the following values: $A_{m1} = 10V$, $A_{m2} = 8V$, $A_c = 20V$, $\omega_{m1} = 314$ rad/s, $\omega_{m1} =$ 628 rad/s and $\omega_c = 314000$ rad/s.		2
Q3	**a)** Describe the generation of SSB-SC signals using the Phase-shift method.	1	2
	b) Twelve signals each bandlimited to 5 KHz are to be transmitted over a single channel using frequency division multiplexing (FDM). If AM SSB-SC modulation with a guard band of 2 kHz is used, compute the total bandwidth of the multiplexed signal.		1
Q4	Analyze the impact of phase error on DSB-SC coherent detection with mathematical derivation.	3	2
Q5	An amplitude modulated (AM) wave is represented by the expression: $X_{AM}(t) = \{10 + 3Cos(314t)\} * Cos(628 * 10^3 t)$. Determine the following: **a)** The minimum and maximum amplitudes of the AM wave. **b)** The frequency components present in the modulated wave? **c)** The power in the upper side bands?	1	3

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