

JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST-1 EXAMINATIONS-FEBRUARY-2024

B.Tech-IV Semester (ECE/CSE-Minor)

COURSE CODE (CREDITS): 18B11EC413 (4)

MAX. MARKS: 15

COURSE NAME: Modern Analog and Digital Communication

COURSE INSTRUCTOR: Dr. Pardeep Garg

MAX. TIME: 1 Hour

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**Note:** (a) All questions are compulsory. (b) Carrying of mobile phone during examinations will be treated as case of unfair means. (c) Marks are indicated against each question in square brackets. (d) The candidate is allowed to make suitable numeric assumptions wherever required for solving problems.

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**Q1(a).** Discuss the concept of bandwidth from communication and networking point of view.

(CO-1, 1 mark)

**Q1(b).** 'Two composite signals with different spectrums can have same bandwidth' justify this statement with the help of an example showing 2 different signals with their spectrums.

(CO-1, 1 mark)

**Q2.** Define modulation. With the help of 3-4 technical points, discuss the need of modulation in communication systems.

(CO-1&2, 1+2 = 3 marks)

**Q3.** An AM signal is represented by the expression:

$$\Phi_{AM}(t) = 10\cos(2\pi \cdot 10^6 t) + 5\cos(2\pi \cdot 10^6 t) \cos(2\pi \cdot 10^3 t) + 2\cos(2\pi \cdot 10^6 t) \cos(4\pi \cdot 10^3 t) \text{ volts}$$

- Find the carrier, and sideband frequency components present & the modulation indices.
- Draw the line spectrum and find the bandwidth of the signal.

(CO-2, 2.5+1.5 = 4 marks)

**Q4.** How can AM (amplitude modulation) signal be demodulated using Envelope detector? Discuss its functioning and derive the expression to compute the optimum value of time constant RC (i.e.  $1/RC \geq \omega_m m_a$ ).

(CO-2, 4 marks)

**Q5.** Compute the power content of the carrier and each of the sidebands for an AM signal having a percentage modulation of 80% and the total power of 2500W.

(CO-2, 2 marks)