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| Question  No | WRT | **2 Mark Questions** | 4 | 2 |  |
| 1 |  | Explain the need for modulation in detail. |  | 2 | CO-1 |
|  |  |  |  |  |  |
| 2 |  | State and prove the duality property of the Fourier transform with an example. |  | 2 | CO-1 |
|  |  |  |  |  |  |
| 3 |  | Define the frequency-shifting property of the Fourier transform and give its mathematical expression. |  | 2 | CO-1 |
|  |  |  |  |  |  |
| 4 |  | Draw the frequency spectrum of the Amplitude modulation signal and derive the bandwidth from it. |  | 2 | CO-1 |
|  |  |  |  |  |  |
| 5 |  | What is the modulation property of the Fourier transform? |  | 2 | CO-1 |
|  |  |  |  |  |  |
| 6 |  | Define Amplitude modulation and draw its waveforms. |  | 2 | CO-2 |
|  |  |  |  |  |  |
| 7 |  | Derive the % of power efficiency when the input is a square waveform. |  | 2 | CO-3 |
|  |  |  |  |  |  |
| 8 |  | Derive the % of power efficiency when the input is a triangular waveform. |  | 2 | CO-3 |
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| Question  No | WRT | **5 Mark Questions** | 4 | 2 |  |
| 1 |  | Draw and explain the basic block diagram of an analog communication system. |  | 5 | CO-2 |
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| 2 |  | A modulating signal m(t)=10cos(2π×103t) is amplitude modulated with a carrier signal c(t)=50cos(2π×105t). Find the modulation index, the carrier power, and the power required for transmitting the AM wave. |  | 5 | CO-3 |
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| 3 |  | A carrier wave of 500 watts is subjected to 100% amplitude modulation.  Determine  (i) power in sidebands (ii) power of the modulated wave. |  | 5 | CO-3 |
|  |  |  |  |  |  |
| 4 |  | Explain the operation of the AM synchronous demodulator with a neat diagram and derivation. |  | 5 | CO-2 |
|  |  |  |  |  |  |
| 5 |  | The antenna current of an AM transmitter is 8A when only the carrier is sent, but it increases to 8.93A when the carrier is sinusoidally modulated. Find the % of modulation index. |  | 5 | CO-3 |
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| 6 |  | 1. An audio signal of 1 kHz is used to modulate a carrier of 500 kHz. Determine (i) sideband frequencies and (ii) bandwidth required. 2. The load current in the transmitting antenna of an unmodulated AM transmitter is 8A. What will be the antenna current when modulation is 40%? |  | 5 | CO-3 |
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| 7 |  | Derive the proof for the modulation property of AM. |  | 5 | CO-3 |
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| Question  No | WRT | **12 Mark Questions** | 4 | 2 |  |
| 1 |  | Describe Amplitude Modulation (AM) with Time-Domain and Frequency-Domain Representations. Derive the expression for an AM wave. |  | 12 | CO-2 |
|  |  |  |  |  |  |
| 2 |  | Explain the detection of AM waves using:  (a) Square Law Detector  (b) Envelope Detector |  | 12 | CO-2 |
|  |  |  |  |  |  |
| 3 |  | Derive i) Carrier power  ii) Total power, and iii) power efficiency for a sinusoidal signal and a square wave. |  | 12 | CO-3 |
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| 4 |  | 1. The maximum peak-to-peak voltage of an AM wave is 16 mV, and the minimum peak-to-peak voltage is 4 mV. Calculate the modulation factor. 2. A 50-kW carrier is to be modulated to a level of (i) 80%, (ii) 10%. What is the total sideband power in each case? 3. A carrier of 100V and 1200 kHz is modulated by a 50V, 1000 Hz sine wave signal. Find the modulation factor. |  | 12 | CO-3 |
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