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| Question  No | WRT | **2 Mark Questions** | 4 | 2 |  |
| 1 |  | Derive the time domain FM equation. |  | 2 | CO-2 |
|  |  |  |  |  |  |
| 2 |  | Derive the NBFM equation. |  | 2 | CO-2 |
|  |  |  |  |  |  |
| 3 |  | Derive the modulation index (β) of the FM signal when the input is a sinusoidal signal. |  | 2 | CO-2 |
|  |  |  |  |  |  |
| 4 |  | An FM wave is given by s(t)=20cos(8π×106t+9sin(2π×103t) Calculate the frequency deviation. |  | 2 | CO-3 |
|  |  |  |  |  |  |
| 5 |  | Draw the waveforms of frequency modulation and demodulation. |  | 2 | CO-2 |
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| Question  No | WRT | **5 Mark Questions** | 4 | 2 |  |
| 1 |  | Define FM, draw the block diagram of NBFM, and explain. |  | 5 | CO-2 |
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| 2 |  | 1. Derive the frequency deviation of an angle-modulated signal. 2. Derive the frequency deviation of an FM signal |  | 5 | CO-3 |
|  |  |  |  |  |  |
| 3 |  | The instantaneous frequency in Hz of each of the following signals.   1. 10 cos (200πt+π/3) 2. 10 cos (20πt+πt2) |  | 5 | CO-3 |
|  |  |  |  |  |  |
| 4 |  | NFM equation is represented by v(t) = 12 cos (6x108t+5sin 1250 t). Determine the following   1. Carrier frequency 2. Modulation index 3. Modulating frequency 4. Maximum frequency deviation. |  | 5 | CO-3 |
|  |  |  |  |  |  |
| 5 |  | A sinusoidal modulating waveform of amplitude 5 V and a frequency of 2 kHz is applied to the FM generator, which has a frequency sensitivity of 40 Hz/volt. Calculate the frequency deviation and modulation index. |  | 5 | CO-3 |
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| Question  No | WRT | **12 Mark Questions** | 4 | 2 |  |
| 1 |  | Derive the total power and sideband power of FM modulations. |  | 12 | CO-3 |
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| 2 |  | Derive the bandwidth of FM with a neat spectrum. |  | 12 | CO-3 |
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| 3 |  | Explain how VCO works as an FM modulator with a neat diagram. |  | 12 | CO-2 |
|  |  |  |  |  |  |
| 4 |  | 1. An FM wave is given by s(t)=20cos(8π×106t+9sin(2π×103t)). Calculate the frequency deviation, bandwidth, and power of the FM wave. 2. A carrier frequency is frequency modulated with a sinusoidal signal of 2 KHz, resulting in a maximum frequency deviation of 5 KHz. Find the approximate bandwidth of the modulated signal. |  | 12 | CO-3 |
|  |  |  |  |  |  |
| 5 |  | Discuss the generation of WBFM using the indirect method with neat diagrams and examples. |  | 12 | CO-2 |
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