



ABV-INDIAN INSTITUTE OF INFORMATION TECHNOLOGY & MANAGEMENT GWALIOR
Minor Exam

Principle of Communication (EE-201)

Duration: 2 hours
Max. Marks: 50

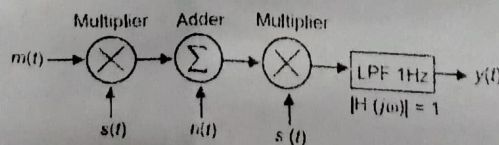
2023EE-012

Date: 24/09/2024
Time: 4-6PM

Important Instructions:

- This is a closed book, closed notes examination.
- This question paper comprises a total of 15 questions, and each question is worth 5 marks.
- Please attempt any 10 questions. If you answer more than 10, only the first 10 will be evaluated.

1. In a Broadcast superheterodyne AM receiver having no RF stage, the loaded Q of the aerial coupling circuit (at the input of the mixer) is 125. If the intermediate frequency is 465KHz. Calculate
(a) The image frequency and its rejection at 1MHz and 30MHz.
(b) The IF required to make the image rejection ratio as good at 30MHz as it is at 1MHz.
2. Show that a synchronous demodulator can demodulate an AM signal $x_{AM}(t) = [A+m(t)] \cos \omega_c t$ regardless of the value of A.
3. An SSB transmission contains 10kW. This transmission is to be replaced by a standard amplitude signal with the same power content. Determine the power content of the carrier and each of the sidebands when the percentage of modulation is 80%.
4. An AM transmitter radiates 9kW of power when the carrier is unmodulated and 10.125kW when the carrier is sinusoidally modulated. Find the modulation index and percentage of the modulation. Now, if another sine wave, corresponding to 40% modulation is transmitted simultaneously, then calculate the total radiated power.
5. The antenna current of an AM transmitter is 10A when it is modulated to a depth of 30% by an audio signal. It increases to 11A when another signal modulates the carrier signal. What will be the modulation index due to the second signal?
6. In the figure given below $m(t) = \frac{2 \sin 2\pi t}{t}$, $s(t) = \cos 200 \pi t$ and $n(t) = \frac{\sin 199 \pi t}{t}$. The output $y(t)$ will be:



7. In a superheterodyne receiver having no RF amplifier, the loaded Q of the antenna coupling circuit (at the input of mixer) is 90. If the intermediate frequency is 455kHz, calculate the following:
(a) The image frequency and image frequency rejection ratio at 950kHz.
(b) The image frequency and image frequency rejection ratio at 10MHz.
8. In a superheterodyne AM receiver having no RF stage, the loaded Q of the aerial coupling circuit is 125. If the intermediate frequency is 465kHz, calculate the following:

- (c) The image frequency and image frequency rejection ratio at 1MHz and 30MHz.
- (d) The intermediate frequency required to make the image rejection ratio as good at 30MHz as it is at 1MHz.
9. An angle modulated signal with carrier frequency $\omega_c = 2\pi \times 10^5$ is described by the equation $\phi(t) = 10\cos(\omega_c t + 5\sin 3000t + 10\sin 2000\pi t)$. Find the deviation ratio.
 10. An angle modulated signal is expressed as $\phi(t) = \cos(2\pi \times 10^8 t + 75\sin 2\pi \times 10^3 t)$. Find the peak deviation of the carrier.
 11. A carrier wave of amplitude 10V and frequency 100MHz is frequency modulated by a sinusoidal voltage. The modulating voltage has an amplitude of 5V and frequency $f_m = 20\text{kHz}$. The frequency deviation constant is 1kHz/volt. Draw the frequency spectrum of the FM wave.
 12. What will be the bandwidth required for the FM signal if the modulating frequency is 1kHz and the maximum deviation is 10kHz? What is the BW required for a DSB FC (AM) transmission?
 13. Write the performance comparison of the AM and FM.
 14. Write the performance comparison of the Standard AM, DSB-SC, SSB and VSB.
 15. Write the methods to generate the SSB-SC.