VIT
Vellore Institute of Technology

Final Assessment Test – November 2019

Course: ECE2024 - Principles of Communication Engineering
Slot: C1
Class NBR(s): 1158
Max. Marks: 100
Time: Three Hours

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS EXAM MALPRACTICE

PART – A (68 Marks)

Answer ALL Questions

1. A modulating signal $10\sin(2\pi \times 10^3)$ is used to modulate a carrier signal $20\sin(2\pi \times 10^4)$. Determine the modulation index, percentage modulation, frequencies of the sideband components and their amplitudes. What will be bandwidth of the modulated signal? [6]
2. Prove that in amplitude modulation, maximum average power transmitted by an antenna is 1.5 times of the carrier power. [6]
3. An SSB transmission contains 10 kW. This transmission is to be replaced by a standard amplitude modulated signal with same power content. Determine the power content of the carrier and each of the sidebands when percentage modulation is 80%. [6]
4. A given AM broadcast station transmits a total power of 50 kW when the carrier is modulated by a sinusoidal signal with a modulation index of 0.707. Determine the carrier power, transmission efficiency and the peak amplitude of the carrier assuming the antenna is represented by a load of $(50 + j0)\Omega$. [6]
5. In an FM system, if the maximum value of the deviation is 75 kHz and the maximum modulating frequency is 10 kHz, calculate the deviation ratio and the bandwidth of the system using Carson's rule. Also show, how the FM is approximately constant bandwidth system for lower baseband frequencies. [6]
6. A carrier wave of amplitude 10V and frequency 100 MHz is FM modulated by a sinusoidal voltage. The modulating voltage has an amplitude of 5 V and the maximum frequency 20 kHz. The frequency deviation constant is 2 kHz/V. Draw the frequency spectrum of the FM wave with associated amplitudes and frequencies of the carrier and sidebands [6]
7. What is aliasing in sampling theory? What precautions should be taken for avoiding it? [6]
8. Draw and explain the block diagram of the PCM system. An analog signal waveform with bandwidth 15 kHz is to be transmitted via binary PCM system. Determine the required transmission rate and the bandwidth. [6]
9. Explain Coherent binary ASK with suitable example and neat waveforms. Also explain its generation and reception with suitable block diagrams. [10]
10. A binary data stream b{k} = {0 0 1 0 0 1 0 0 1 1} needs to be transmitted using DPSK technique. Prove that the reconstruction of the DPSK signal is independent of the choice of the extra reference bit. [10]

PART – B (4 X 8 = 32 Marks)

Answer any FOUR Questions

11. What is the capture effect in FM? Explain the necessity of pre-emphasis and de-emphasis in FM. [8]
12. Explain, with the help block diagram, the Armstrong method of generating FM signal. [8]
13. Draw the block diagram of phase cancellation SSB generation and explain how the carrier and the unwanted sideband are supressed. [8]
14. Give block diagram of a pseudorandom sequence generator and explain its working. Also define the sequence length. [8]
15. Mention the properties of the maximum length sequence in spread spectrum communication system. Also give the block diagram of spreading code generator. [8]
16. Explain early/ late gate symbol synchronizers in digital communication with suitable diagram and waveforms. [8]
17. Explain Correlation Receiver in digital communication with the help of suitable diagram. [8]

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