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INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal-500043, Hyderabad

B.Tech IV SEMESTER END EXAMINATIONS (REGULAR/SUPPLEMENTARY) - AUGUST 2023

Regulation: UG-20

ANALOG AND DIGITAL COMMUNICATIONS

Time: 3 Hours (ELECTRONICS AND COMMUNICATIONS ENGINEERING) Max Marks: 70

Answer ALL questions in Module I and II

Answer ONE out of two questions in Modules III, IV and V

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

MODULE – I

- (a) Illustrate the time and frequency domain description of single sided band – suppressed carrier wave and sketch the spectrum of SSBSC-LSB and SSBSC-USB waveform.
[BL: Understand| CO: 1|Marks: 7]
- (b) Find the various frequency components and their amplitudes in the voltage given by
 $v(t) = 50(1 + 0.7 \cos 5000t - 0.3 \cos 1000t) \sin 5 \times 10^6 t$. Draw the single sided spectrum. Also evaluate the modulated and sideband power.
[BL: Apply| CO: 1|Marks: 7]

MODULE – II

- (a) Explain in detail about indirect method for wide band FM (WBFM) generation and also show how narrow band FM can be converted into WBFM using frequency multiplier.
[BL: Understand| CO: 2|Marks: 7]
- (b) A 107.76MHz carrier signal is frequency modulated by a 7 kHz sine wave. The resultant FM signal has a frequency deviation of 50 kHz. Determine carrier swing, highest and lowest frequencies of frequency modulated signal, and modulation index of FM wave [BL: Apply| CO: 2|Marks: 7]

MODULE – III

- (a) Demonstrate differential pulse code modulation technique transmitter and receiver with a block diagram and also explain about granular noise and slope overload noise occurs in delta modulation.
[BL: Understand| CO: 3|Marks: 7]
- (b) The input to the PCM system is $m(t) = 10 \cos 2\pi 10^4 t$. The signal is sampled at Nyquist rate and each sample is encoded in to 4-bits. Determine i) Bit rate ii) Bandwidth, iii) Signal to noise ratio.
[BL: Apply| CO: 3|Marks: 7]
- (a) Summarize about role of monostable multivibrator for obtaining the PWM and PPM output with suitable waveform.
[BL: Understand| CO: 4|Marks: 7]
- (b) Draw the block diagram of elements of PCM system and explain the function of each block in a PCM system.
[BL: Understand| CO: 4|Marks: 7]

MODULE – IV

5. (a) Describe how BPSK modulated signal can be generated using polar NRZ encoder and also show how demodulated signal can be obtained using square law detector.
[BL: Understand| CO: 5|Marks: 7]
- (b) Elaborate the principle of ASK modulation and demodulation technique and also find the ASK output signal for the input sequence.
 $X(t) = 1\ 0\ 1\ 1\ 0\ 1\ 0\ 1\ 1\ 1$.
[BL: Apply| CO: 5|Marks: 7]
6. (a) Determine the expression for probability of error for QPSK modulation technique and compare with PSK.
[BL: Understand| CO: 5|Marks: 7]
- (b) Find the peak frequency deviation, minimum bandwidth, and band for a binary FSK signal with a mark frequency of 49 kHz, a space frequency of 51 kHz, and an input bit rate of 2 kbps.
[BL: Apply| CO: 5|Marks: 7]

MODULE – V

7. (a) Discuss how the code division multiple access technique can be employed in the direct sequence spread spectrum environment.
[BL: Understand| CO: 6|Marks: 7]
- (b) The generator matrix for a linear binary code is
[BL: Apply| CO: 6|Marks: 7]
- $$\begin{bmatrix} 0 & 0 & 1 & 1 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$$
- i) Express G in systematic [P | I] form
ii) Determine the parity check matrix H for the code
iii) Construct the table of syndromes for the code
iv) Determine the minimum distance for the code
v) Demonstrate that the codeword corresponding to information sequence 101 is orthogonal to H.
8. (a) Mention the properties of Pseudo noise sequence generator and also explain its operation using a suitable example.
[BL: Understand| CO: 6|Marks: 7]
- (b) A spread spectrum communication system has the following parameters. Information bit duration $T_b = 1.024\text{msecs}$ and PN chip duration of 1µsecs. The average probability of error of system is not to exceed 10^{-5} calculate
i) Length of shift register
ii) Processing gain
iii) Jamming margin
[BL: Apply| CO: 6|Marks: 7]

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