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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 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) Determine the expression for envelope detection of a Vestigial side band wave with carrier using necessary equation.  
[BL: Apply| CO: 1|Marks: 7]

## MODULE – II

- (a) Compare amplitude modulation and frequency modulation techniques and also mention the advantages of FM over AM.  
[BL: Understand| CO: 2|Marks: 7]
- (b) Explain in detail about Indirect method for WBFM generation and also show how narrow band FM can be converted into Wide band FM using frequency multiplier.  
[BL: Understand| CO: 2|Marks: 7]

## MODULE – III

- (a) Explain about role of monostable multivibrator for obtaining the PWM and PPM output with suitable waveform.  
[BL: Understand| CO: 3|Marks: 7]
- (b) Deduce an expression for differential pulse code modulation technique and also explain about granular noise and slope overload noise occurs in DPCM.  
[BL: Apply| CO: 3|Marks: 7]
- (a) Discuss about the ideal, natural and flat-top sampling process in PCM with neat sketch.  
[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

- (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 also discuss about the constellation diagram.

[BL: Understand| CO: 5|Marks: 7]

- (b) Determine 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) Outline the frequency HOP spread spectrum with suitable block diagram and compare slow frequency and fast frequency hopping spectrum.

[BL: Understand| CO: 6|Marks: 7]

- (b) A Spread spectrum communication system has the following parameters. Information bit duration  $T_b = 1.024$  msec and PN chip duration of 1  $\mu$ sec. 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]

