

**R15**

Code No: 126ZN

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD**

**B. Tech III Year II Semester Examinations, July - 2023**

**DIGITAL COMMUNICATIONS**  
(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

**Note:** i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) In Part B, Answer any one question from each unit. Each question carries 10 marks and may have a, b as sub questions.

**PART - A**

**(25 Marks)**

- 1.a) Discuss the different noise effects in Delta Modulation. [2]
- b) What is the trade-off between bandwidth and S/N? [3]
- c) What are the types of digital modulation techniques? [2]
- d) Explain how carrier synchronization is done in QPSK. [3]
- e) What is an Optimum Filter? [2]
- f) Calculate the amount of information if binary digits occur with an equal likelihood in binary PCM systems. [3]
- g) Distinguish between Linear Codes and Convolutional codes. [2]
- h) List the properties of cyclic codes. [3]
- i) Define spread spectrum communication [2]
- j) Write the properties of PN sequence. [3]

**PART - B**

**(50 Marks)**

2. Draw and explain the basic block diagram of digital communication system. [10]

**OR**

3. The information in an analog signal voltage waveform is to be transmitted over a PCM system in an accuracy of  $\pm 0.1\%$  (full scale). The analog voltage waveform has a bandwidth of 100 Hz and an amplitude range of -10 V to +10 V.
  - a) Find the minimum sampling rate required.
  - b) Find the number of bits in each PCM word.
  - c) Minimum bit rate required in the PCM signal.
  - d) Find the minimum absolute channel bandwidth required for the transmission of the PCM signal. [10]

4. Explain with neat block diagram the generation and recovery of BPSK. [10]

**OR**

- 5.a) With a neat sketch, explain the non-coherent detection of FSK. [5]
- b) Write a short note on ASK modulator. [5]

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6. A source is transmitting six messages with probability 0.30, 0.25, 0.15, 0.12, 0.10 and 0.08 respectively.

a) Find the binary Huffman code.

b) Determine its average word length, efficiency, and redundancy.

[5+5]

**OR**

7. What is a matched filter? How does it differ from an optimum filter? Derive an expression for impulse response of matched filter. [10]

8. Consider five symbols given by the probabilities  $1/2, 1/4, 1/8, 1/16, 1/16$ . Use Shannon-Fano algorithm to develop an efficient code and for that code, calculate the average number of bits/symbol. Compare with H. [10]

**OR**

9. Explain the Viterbi algorithm with an example. [10]

10. Draw and explain the block diagram of DSSS and explain the spreading operation with one example. [10]

**OR**

11. What is Frequency Hopping Spread Spectrum (FHSS)? Explain the operation of FHSS with neat block diagram. [10]

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