

III B. Tech I Semester Supplementary Examinations, June/July-2022
DIGITAL COMMUNICATIONS

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

UNIT-I

1. a) Explain how the compressor and expander are used for non-uniform quantization. [8M]
 b) Explain why delta modulation is a special case of DPCM. [7M]

(OR)

2. a) What do you understand by aperture effect? Explain. [8M]
 b) For a PCM signal, find $L = 2^n$ if the compression parameter $\mu = 100$ and the minimum required SNR is 40 dB. Determine the output SQNR. [7M]

UNIT-II

3. a) Explain the decoding logic for DPSK demodulator. [8M]
 b) What are the different signaling techniques? Explain. [7M]

(OR)

4. a) What are the different schemes that are used for digital data transmission? Explain briefly. [8M]
 b) In wireless digital communication, it is observed that as the received signal strength reduces, the rate of data transfer also reduces. Explain the reason by means of constellation diagram. [7M]

UNIT-III

5. a) Draw the block diagram of coherent ASK receiver, and explain its operation with necessary equations. [8M]
 b) Explain why the matched filter is called as an optimum filter. [7M]

(OR)

6. a) Explain how the Schwartz inequality is used to find $H_{opt}(f)$ of a matched filter. [8M]
 b) Explain how the FSK signal is demodulated using coherent receiver. [7M]

UNIT-IV

7. a) A discrete memoryless source has symbols A, B and C as its alphabet with corresponding probabilities 0.5, 0.3 and 0.2 respectively. Compute the entropy of the source and develop the code using Huffman source coding algorithm. [8M]
 b) Define mutual information and list its properties. [7M]



(OR)

8. a) A binary memoryless source emits symbols 0 and 1 with probabilities p_0 and p_1 , respectively. The source is connected to a binary asymmetric channel with transition probabilities: $P(0|0) = p_2$, $P(1|0) = p_3$, $P(0|1) = p_4$ and $P(1|1) = p_5$. Derive an expression for entropy of the channel output. [8M]
- b) Write notes on trade-off between bandwidth and SNR. [7M]

UNIT-V

9. a) The generator polynomial $g(x) = x^{10} + x^8 + x^5 + x^4 + x^2 + x + 1$ generates a cyclic BCH (15, 5) code. Find the codewords for the data (i) 10110 (ii) 10000 (iii) 10001 (iv) 10011 [8M]
- b) A convolutional encoder is described by the following equations: $x_1 = d_k \oplus d_{k-1} \oplus d_{k-2} \oplus d_{k-3}$, $x_2 = d_k \oplus d_{k-1}$, where x_1 and x_2 are the outputs of mod-2 adders and d_k is the k^{th} user bit. Draw the state transition diagram of the encoder. [7M]

(OR)

10. a) The generator polynomial of a cyclic code is $1 + D + D^3$. Draw the encoder and decoder diagrams. Find any two codewords. [8M]
- b) What is syndrome decoding? Does a syndrome uniquely identify the actual error pattern? [7M]

