



Paper Id: 252122

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Subject Code: HTAC401

Roll No:

BTECH-HON
(SEM IV) THEORY EXAMINATION 2024-25
ADVANCED DIGITAL COMMUNICATION TECHNIQUES

TIME: 3 HRS

M.MARKS: 100

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief.

2 x 10 = 20

Q No.	Question	CO	Level
a. ✓	Define signal space in communication systems.	01	K1
b. ✓	What is a vector space? Give an example in the context of signal representation.	01	K1
c. ✓	What is Pulse Amplitude Modulation (PAM) in digital communication?	02	K1
d. ✓	Define a matched filter.	02	K1
e. ✓	What is M-ary PSK?	03	K1
f. ✓	State one advantage of QPSK over BPSK.	03	K1
g. ✓	What is the basic difference between block codes and convolutional codes?	04	K1
h. ✓	What is the purpose of a tree diagram in convolutional coding?	04	K1
i. ✓	Define frequency hopping.	05	K1
j. ✓	Mention one advantage of spread spectrum modulation.	05	K1

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

Q No.	Question	CO	Level
a.	Define orthogonal expansion of signal and discuss the importance of orthogonality in the design and detection of digital signals.	01	K1
b.	Explain the modulator and demodulator of QPSK (Quadrature Phase Shift Keying) systems.	02	K2
c. ✓	What is Amplitude Shift Keying (ASK). Describe it using its block diagram.	03	K1
d. ✓	The generator matrix for a (6,3) block code is given below. Find code vectors for message 000 and 001 of this code $G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 1 & 0 \end{bmatrix}$	04	K3
e. ✓	Draw the block diagram of FHSS transmitter and receiver.	05	K2

SECTION C

3. Attempt any one part of the following:

10 x 1 = 10

Q No.	Question	CO	Level
a. ✓	Discuss modulation schemes where each symbol depends only on the current input data in digital communication.	01	K2
b.	Discuss the concept of signal constellation diagram. Compare and contrast different memory less modulation methods in terms of bandwidth efficiency and error performance.	01	K2



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Q No.	Question	CO	Level
a.	Explain the modulator and demodulator of DPSK (Differential Phase shift Keying) system.	02	K2
b.	Explain the modulator of Binary Phase shift keying (BPSK). What are its advantages and disadvantages?	02	K2

5. Attempt any one part of the following: **10 x 1 = 10**

Q No.	Question	CO	Level
a.	Explain the difference between M-ary FSK and M-ary PSK Digital Carrier modulation techniques.	03	K2
b. ✓	Explain the working of Minimum Shift Keying (MSK). Show how it is a special case of FSK.	03	K2

6. Attempt any one part of the following: **10 x 1 = 10**

Q No.	Question	CO	Level
a. ✓	Explain the structure of a convolutional encoder and define the state diagram used to represent its operation.	04	K2
b.	Define a linear block code and discuss the key properties of cyclic codes in digital communication.	04	K1

7. Attempt any one part of the following: **10 x 1 = 10**

Q No.	Question	CO	Level
a.	Explain pseudo-noise (PN) sequences. Describe how they are generated and their important properties.	05	K2
b. ✓	Define the concept of the Direct Sequence Spread Spectrum (DSSS) technique. Differentiate between slow frequency hopping and fast frequency hopping.	05	K4