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**BTECH**  
**(SEM VI) THEORY EXAMINATION 2023-24**  
**DIGITAL COMMUNICATION**

TIME: 3 HRS

M.MARKS: 100

**Note:** 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

**1. Attempt all questions in brief.**

a.	State properties of pdf.	02
b.	Discuss about complete probability scheme.	02
c.	Describe Eye diagram.	02
d.	Illustrate roll-off factor in pulse shaping.	02
e.	Discuss the disadvantages of coherent demodulation schemes.	02
f.	Discuss the disadvantages of non-coherent FSK.	02
g.	Illustrate the term spread spectrum and its advantages.	02
h.	Compare ASK, FSK, and PSK based on the probability of error performance.	02
i.	Discuss the reason of using the logarithmic function for the measurement of information	02
j.	Appraise that the mutual information is symmetric in nature.	02

**SECTION B**

**2. Attempt any three of the following:**

a.	Demonstrate random process. Illustrate the characteristics of the Strict sense stationary process.	10
b.	Discuss Duobinary signaling. Discuss the advantages of using it.	10
c.	Describe ASK modulation and demodulation in detail.	10
d.	Illustrate FHSS with FSK modulation with the help of Transmitter and Receiver diagram. Discuss its disadvantages also.	10
e.	Analyze the relations between different entropies. Also discuss physical interpretations of all entropies.	10

**SECTION C**

**3. Attempt any one part of the following:**

a.	Consider the general Gaussian PDF: $P_x(x) = \frac{1}{2\sqrt{2\pi}} e^{-(x-m)^2/2\sigma^2}$ Determine the mean and variance.	10
b.	Discuss Wide sense stationary process. Determine whether the given random process is a wide sense stationary process or not? $X(t) = A\cos(\omega t + \Omega)$ Where, $\Omega$ is a uniformly distributed random variable between 0 to $2\pi$ .	10

**4. Attempt any one part of the following:**

a.	Illustrate scrambling. Also describe the reason of using it. If the data stream is 101010100000111, Determine the scrambled output. Given $F=D^3(XOR)D^5$	10
b.	Derive expression for the PSD of Polar line codes.	10

**5. Attempt any one part of the following:**

a.	Discuss DPSK modulation and demodulation in detail.	10
b.	Discuss FSK modulation and demodulation in detail.	10

**6. Attempt any one part of the following:**

a.	Analyze that the output signal of a matched filter is proportional to a shifted version of the Autocorrelation function of the input signal to which the filter is matched.	10
b.	Derive an expression for the probability of error of PSK modulation.	10



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7. Attempt any *one* part of the following:

a.	A memoryless source emits six messages with probability 0.3, 0.25, 0.15, 0.12, 0.1 and 0.08. Here, $M=2$ . 1. Find the binary Huffman code. 2. Determine its average word length, efficiency and redundancy	10
b.	Design (2,1,2) Convolutional encoder.	10

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