1. Which of the following is not a type of communication channel?
a) Binary Symmetric Channel
b) Discrete Memoryless Channel
c) Joint Probability Channel
d) Continuous Channel
Answer: c) Joint Probability Channel
Explanation: Communication channels include binary symmetric, discrete memoryless, and continuous channels, but joint probability channel is not a recognized type.

2. What does the Channel Matrix represent in communication theory?
a) Probability of error for each transmitted symbol
b) Mapping between input and output symbols
c) Signal-to-noise ratio of the channel
d) Capacity of the channel
Answer: b) Mapping between input and output symbols
Explanation: The Channel Matrix describes the relationship between the input symbols and the corresponding output symbols in a communication channel.

3. The Binary Symmetric Channel has a probability of error of 0.2. What is its channel capacity?
a) 0.2 bits
b) 0.8 bits
c) 1 bit
d) 0 bits
Answer: b) 0.8 bits
Explanation: The channel capacity of a binary symmetric channel with error probability p is given by 1 – H(p), where H(p) is the binary entropy function. For p = 0.2, the capacity is 1 –

H(0.2) = 0.8 bits.

4. Which theorem establishes the fundamental limit of data transmission over noisy channels?
a) Nyquist Theorem
b) Shannon's Theorem
c) Gauss's Theorem
d) Fourier's Theorem
Answer: b) Shannon's Theorem
Explanation: Shannon's Theorem, also known as the Shannon Capacity Theorem, establishes the maximum rate at which error-free information can be transmitted over a noisy communication channel.

5. The channel capacity of a Binary Erasure Channel with probability of erasure of 0.1 is:
a) 0.1 bits
b) 0.9 bits
c) 1 bit
d) 0 bits
Answer: c) 1 bit
Explanation: For a Binary Erasure Channel, the channel capacity is equal to 1 minus the probability of erasure. Thus, for a probability of erasure of 0.1, the capacity is 1 – 0.1 = 0.9 bits.

6. Which theorem states that a discrete memoryless channel can be approached with arbitrarily small error probability by sufficiently long codes?
a) Nyquist Theorem
b) Shannon's Theorem

c) Huffman’s Theorem

d) Noisy Channel Coding Theorem

Answer: d) Noisy Channel Coding Theorem

Explanation: The Noisy Channel Coding Theorem, formulated by Claude Shannon, asserts that for any given positive ε, if n is sufficiently large, there exist codes of length n that can achieve error probabilities less than ε on a discrete memoryless channel.

7. What is the capacity of a channel with infinite bandwidth, according to Shannon’s Theorem?

a) Infinite bits per second

b) Zero bits per second

c) Depends on the signal-to-noise ratio

d) Cannot be determined

Answer: a) Infinite bits per second

Explanation: Shannon’s Theorem states that the capacity of a channel with infinite bandwidth is theoretically infinite, given that there is no restriction on the rate of information transmission.

8. Which type of channel does not have memory of past symbols?

a) Discrete Memoryless Channel

b) Continuous Channel

c) Binary Symmetric Channel

d) Joint Probability Channel

Answer: a) Discrete Memoryless Channel

Explanation: Discrete Memoryless Channels are channels in which each output is only dependent on the current input symbol and not on any previous symbols.

9. What is the primary application of the Channel Coding Theorem?
a) Error detection
b) Error correction
c) Channel capacity estimation
d) Signal modulation
Answer: b) Error correction
Explanation: The Channel Coding Theorem deals with the encoding of information for transmission over a noisy channel in such a way that errors can be detected and corrected at the receiving end.

10. Which theorem deals with the maximum achievable data rate over a noisy channel?
a) Shannon’s Theorem
b) Fourier’s Theorem
c) Gauss’s Theorem
d) Noisy Channel Coding Theorem
Answer: a) Shannon’s Theorem
Explanation: Shannon’s Theorem establishes the maximum achievable data rate, also known as channel capacity, over a noisy channel.

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