Assignment 8

Digital Communication System-I

May 2023

Please answer the following questions:

Q 1: Which of the following statement is correct?

(a) The Viterbi decoder proceeds through the trellis level by level in search of the path with the best metric.

(b) The Viterbi algorithm usually terminated because it helps in the performance of the Viterbi decoder.

(c) At each level, the decoder compares the metric of all partial paths entering each state.

(d) All of the above.

Q 2: Consider a binary CPM scheme with a modulation index $h = 2/3$ and a partial response pulse with $L = 4$. The total number of states are

(a) 8

(b) 12

(c) 24

(d) 48

Q 3: In Viterbi's algorithm, the selected paths are known as

(a) Carriers

(b) Defenders

(c) Destroyers

(d) Survivors

Q 4: For BSC, the maximum likelihood decoder decodes the received sequence $\mathbf{r}$ into code sequence v that minimizes the Hamming distance $d(\mathbf{r}, v)$

(a) True

(b) False

Q 5: The complexity of Viterbi decoder grows linearly with the increase in memory of the system.

(a) True

(b) False

Q 6: Which of the following options is correct.

Statement 1: For the Viterbi decoding algorithm applied to CPM signals, we discard the paths with shorter Euclidean distance.

Statement 2: Viterbi algorithm is a sequential trellis search algorithm that performs MAP sequence detection

(a) Statement 1:True; Statement 2:True.

(b) Statement 1:False; Statement 2:False.

(c) Statement 1:False; Statement 2:True.

(d) Statement 1:True; Statement 2:False.

Q 7: For which value of L the distance bound $(d_B^2(h))$ is higher for a partial response CPM signal with raised cosine pulse?

(a) 2

(b) 3

(c) 4

(d) 6

Q 8: With $K_{\delta_{\min}}$ as the number of paths having the minimum Euclidean distance 2 between any two signals, the error rate performances for CPM for $\frac{E_b}{N_0} = 5$ dB can be approximated by

(a) $1.8786 \times 10^{-4} K_{\delta_{\min}}$

(b) $2.8 \times 10^{-2} K_{\delta_{\min}}$

(c) $1.8 \times 10^{-3} K_{\delta_{\min}}$

(d) $6 \times 10^{-3} K_{\delta_{\min}}$

Q 9: The expression for the upper bound d_B^2 as a function of the modulation index h for full response CPM with rectangular pulses is given by

(a) $d_B^2(h) = \min_{1 \le k \le M-1} \left\{ (2 \log_2 M) \left(1 - \frac{\sin 2k\pi h}{2k\pi h}\right) \right\}$

(b) $d_B^2(h) = \min_{1 \le k \le M-1} \left\{ (4 \log_2 M) \left(1 - \frac{\sin 2k\pi h}{2k\pi h}\right) \right\}$

(c) $d_B^2(h) = \min_{1 \le k \le M-1} \left\{ (2 \log_2 M) \left(1 - \frac{\sin 2k\pi h}{k\pi h}\right) \right\}$

(d) $d_B^2(h) = \min_{1 \le k \le M-1} \left\{ (4 \log_2 M) \left(1 - \frac{\sin 4k\pi h}{4k\pi h}\right) \right\}$

Q 10: Find the upper bound $(d_B^2(h))$ for CPFSK with $M = 2$ for $h = \frac{2}{3}$.

(a) 2.1134

(b) 2.3118

(c) 2

(d) 2.6124