BRAC University
Department of Computer Science and Engineering

CSE 443: Bioinformatics-I (C)

Quiz 04: Summer 2025 Time: 15 Minutes Marks: 15

Name		ID		Section	

Q1. Hidden states in genomics typically correspond to: (A) DNA sequences (B) CpG island vs background (C) Codons only (D) Proteins

Q2. In 2-state HMM with self-transition 0.95, path likely: (A) Switch often (B) Stay long in same state (C) Depend only on emissions (D) Random

Q3. Suppose emissions $P(C|I) = 0.35, P(G|I) = 0.35, P(C|B) = 0.2, P(G|B) = 0.2$. Observing "CG" favors: (A) Background (B) Island (C) Equal (D) None

Q4. Which HMM feature allows island $\leftrightarrow$ background transitions? (A) Emissions (B) Transition probabilities (C) Backpointers (D) Priors

Q5. The Forward algorithm differs from Viterbi because: (A) Uses max (B) Uses sum (C) Higher complexity (D) Not for HMMs

Q6. A Viterbi path predicting long I corresponds to: (A) Promoter (B) CpG island (C) Repeat (D) Poly-A tail

Q7. If initial probs equal, first choice depends only on: (A) Emissions (B) Transitions (C) Both (D) None

Q8. A sharp increase in log-odds score suggests: (A) Transition to background (B) Transition to island (C) Error (D) No change

Q9. In log-space, Viterbi recurrence becomes: (A) Sum of logs (B) Max of sums of logs (C) Product of logs (D) Difference of logs

Q10. Which is not part of HMM? (A) State set Q (B) Transition matrix A (C) Emission matrix E (D) Alignment score matrix

Q11. If sequence ends with G and emissions favor I, Viterbi likely: (A) End in I (B) End in B (C) Switch randomly (D) Depend only on transitions

Q12. In CpG detection, background state has: (A) Equal base probs (B) More A/T than G/C (C) More G/C than A/T (D) Only CpG

Q13. If $V_{t-1}(B) = 0.2, V_{t-1}(I) = 0.3$, transitions $B \to I = 0.2, I \to I = 0.8$, then for I: (A) $\max(0.2 \cdot 0.2,\ 0.3 \cdot 0.8)$ (B) $\max(0.2 \cdot 0.8,\ 0.3 \cdot 0.2)$ (C) Sum (D) None

Q14. Which algorithm is used for parameter re-estimation? (A) Forward (B) Baum-Welch (C) Viterbi (D) BLAST

Q15. When applying Viterbi to CpG detection, output is: (A) Probability (B) Segmentation into background/island (C) CpG count (D) GC%