Unique Paper Code: 32237905

Name of the Paper: DSE-Computational Biology

Name of the Course: B.Sc. Hons. Zoology CBCS

Semester: V

Duration: 3 hours

Maximum Marks: 75 marks

Instructions for candidates: Attempt any four questions. All questions carry equal marks.

Q.1 A group of researchers have identified a coloured pigment from a soil bacterium. This pigment is found to be effective against a particular disease. So, based on the usefulness of this pigment, the researchers deduced the active molecule from this pigment. Now, they are interested in making an FDA approved drug from this active molecule. In this respect, design a step-wise procedure by which they can design the drug from that molecule and get it approved by FDA. Elaborate your answer using suitable diagrams or flowcharts. (18.75)

Q.2 "Bioinformatics based studies provide solutions for various problems but suffer from various limitations too". Justify the statement with suitable examples. (18.75)

Q.3 What do you understand by the statement, "Biological databases can be classified according to the source and type of data"? Explain with suitable examples. (18.75)

Q.4 Assume that a protein 'X' was found to be critical for the survival of SARS-CoV-2 virus. Hence it was suggested to be a potent target protein for binding of a drug molecule. Now, assume that you are working with SARS-CoV-2 proteins in a laboratory using Biosafety cabinet P4 and you want to design a potent drug against protein 'X'. Describe different wet lab methods or techniques which can be used to deduce the amino acid sequence of protein 'X', followed by various methods which can be used to unravel the structure of this protein using the sequence information only. (18.75)

Q.5 A student is asked to perform sequence alignment between closely related Human and Chimpanzee beta globin proteins. Out of PAM30, PAM120 and PAM250, which scoring matrix should he/ she choose for this? Also explain how it would differ if he/ she uses

BLOSUM scoring matrix. Justify your answer explaining how PAM and BLOSUM matrices are related to sequence alignment. (18.75)

Q.6 The length of a common carp, *Catla catla*, is normally distributed. The mean length of 100 fishes was found to be 10.6 inches. Use a suitable statistical test to know if this group of fishes belongs to a population with mean length of 10.3 and standard deviation of 2 (Take $\alpha = 0.05$)? (18.75)