



# MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

VI SEMESTER B.TECH. EXTERNAL EXAMINATIONS APRIL 2019

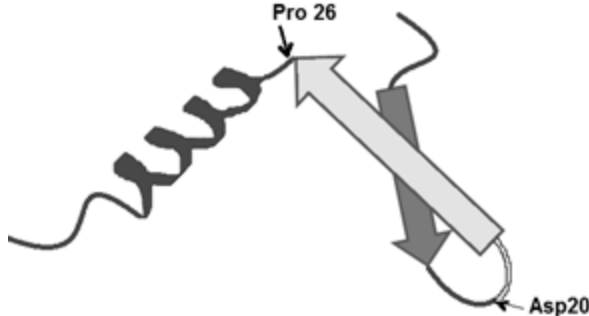
SUBJECT: BIOINFORMATICS[BIO 3201]

Date of Exam: **23/04/2019** Time of Exam: **2.00 PM – 5.00 PM** Max. Marks: **50**

## Instructions to Candidates:

- ❖ Answer ALL the questions & missing data may be suitable assumed

1A.	Assume that you have a protein of unknown function from a bacterium. You have made a knock-out mutant, but the bacteria die immediately without the corresponding gene. You have sequenced the protein. What steps would you take to guess the function of the protein? What kind of information would you look for?	3
1B.	Describe the following in relation to sequence alignment: (a) GAP penalties (b) Similarity matrix (c) Distant matrix	3
1C.	Do a global alignment of the sequences <i>m</i> (ACTGATTCA) and <i>n</i> (ACGCATCA) using Needleman-Wunsch algorithm and also explain the trace-back step in detail. You may use match score of +2, mismatch score of -1, and a gap score of -2	4
2A.	Explain the algorithm of BLAST	3
2B.	Sketch a Eukaryotic Pre-mRNA and describe the complexities of gene finding	3
2C.	You are assigned to design a set of primers for the given sequence. Validate the designed primers and write down the primer sequences with orientations  5'- TTG TGG GTC ACA GTC TAT TAT GGG GTG CCT GTG TGG AAA GAA GCAACC ACC..... (middle part of the gene is truncated) ..... CCA TTA GGA CTA GCACCC ACC AAG GCA AAA AGA AGA GTG GTG CAG AGA GAA AAA AGA -3'	4
3A.	Assume a polypeptide that is comprised of L-amino acids folds into an $\alpha$ -helix. What would happen if it is interrupted by inserting D-amino acids? What change do you observe in the Ramachandran's Plot? Why?	3

3B.	<p>What happens when a Pro26 located at the junction of beta-strand and the terminal of the following alpha helix, is replaced with Ala at 26<sup>th</sup> position?</p> 	3																																				
3C.	Draw a flow diagram for homology modeling process with refinement steps	4																																				
4A.	How would you measure the sensitivity and specificity of a predicted gene? Give an example	3																																				
4B.	Explain “all-beta” protein topologies with examples	3																																				
4C.	Elaborate the structure-function relationship of DNA polymerase β-clamp	4																																				
5A.	Draw "by hand" the rooted tree corresponding to a given NEWICK string ((G,E),((C,((A,K,B),F)),((D,H),M)))	3																																				
5B.	How would you explain the support structures of a butterfly wing and those of bird wings in the context of evolution?	3																																				
5C.	<p>Use the following distance matrix and construct a tree based on UPGMA</p> <table><tr><th></th><th>Bovin</th><th>Pig</th><th>Rat</th><th>Mouse</th><th>Human</th></tr><tr><th>Bovin</th><td>0</td><td>0.098</td><td>0.197</td><td>0.204</td><td>0.173</td></tr><tr><th>Pig</th><td>0.098</td><td>0</td><td>0.181</td><td>0.189</td><td>0.163</td></tr><tr><th>Rat</th><td>0.197</td><td>0.181</td><td>0</td><td>0.072</td><td>0.176</td></tr><tr><th>Mouse</th><td>0.204</td><td>0.189</td><td>0.072</td><td>0</td><td>0.204</td></tr><tr><th>Human</th><td>0.173</td><td>0.163</td><td>0.176</td><td>0.204</td><td>0</td></tr></table>		Bovin	Pig	Rat	Mouse	Human	Bovin	0	0.098	0.197	0.204	0.173	Pig	0.098	0	0.181	0.189	0.163	Rat	0.197	0.181	0	0.072	0.176	Mouse	0.204	0.189	0.072	0	0.204	Human	0.173	0.163	0.176	0.204	0	4
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