Question Paper

Exam Date & Time: 28-Jun-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. (BIOINFORMATICS/SYSTEMS BIOLOGY) DEGREE EXAMINATION - JUNE/JULY 2023
SUBJECT: MBI 504 - BIOINFORMATICS ALGORITHM AND APPLICATIONS
MSB 506 - SYSTEMS BIOLOGY ALGORITHMS
(OBE - 2021 REGULATION)

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

Illustrate where necessary.

1A)	What are the different types of gap penalties?	(3.5)
1B)	Write a note on substitution matrices.	(3.5)
1C)	Classify machine learning and describe the application areas.	(3.5)
1D)	Explain the concept of homology.	(3.5)
2A)	What are the different categories of gene prediction programs?	(7)
2B)	Explain the heuristic algorithm that powers BLAST.	(7)
2C)	What is Hidden Markov Model (HMM)? Demonstrate the application of HMM for gene prediction.	(7)
2D)	Elaborate on the significance and applications of sequence alignment.	(7)
3A)	What is a phylogenetic tree? Explain the different types of phylogenetic tree and describe the steps taken to build one.	(14)
3B)	Explain the global alignment algorithm used in sequence alignment with an example.	(14)

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Question Paper

Exam Date & Time: 30-Jun-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. (BIOINFORMATICS/SYSTEMS BIOLOGY) DEGREE EXAMINATION - JUNE/JULY 2023
SUBJECT: MBI 506 - MOLECULAR MODELLING AND SIMULATION
MSB 502 - STRUCTURAL BIOINFORMATICS
(OBE - 2021 REGULATION)

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

Illustrate where necessary.

1A)	Add a note QSAR approach.	(3.5)
1B)	Protein structure is more conserved than the sequence. Justify the statement.	(3.5)
1C)	Explain the Ramachandran plot and its importance.	(3.5)
1D)	Add a note on *in silico* estimation of ADMET properties and its significance.	(3.5)
2A)	Explain the various structural file formats for small chemical molecules.	(7)
2B)	Explain the X-ray crystallography method to determine molecular structures.	(7)
2C)	Write the features of the Protein Data Bank and its file format.	(7)
2D)	Briefly explain the Bioinformatics resources to study the impact of an amino acid substitution on the protein structure and function.	(7)
3A)	Explain the computational approaches for drug design.	(14)
3B)	With example, explain different types of protein structural symmetries.	(14)

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Question Paper

Exam Date & Time: 05-Jul-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. BIOINFORMATICS / M. Sc. TISSUE ENGINEERING / M. Sc. MOLECULAR BIOLOGY AND HUMAN GENETICS / M. Sc. GENOME ENGINEERING DEGREE EXAMINATION - JUNE/JULY 2023
SUBJECT: MBI 508/ MTE 510 / MBH 510/ MGE 512 - MATHEMATICS AND R PROGRAMMING
(OBE - 2021 REGULATION)

Answer ALL questions.
Illustrate where necessary

Marks: 70 **Duration: 180 mins.**

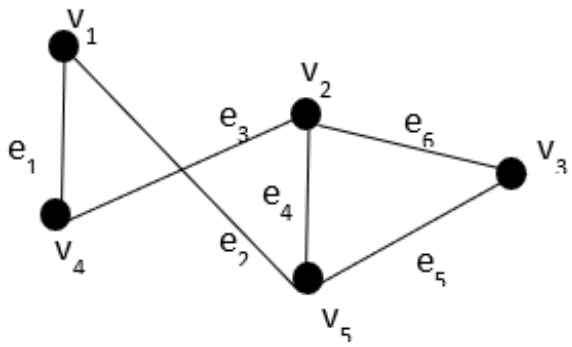
1)	With an example, explain various types of plots and graphs in R	(14)
2)	With an example, add a note on R data structures.	(14)

Explain the following briefly:

3A)	What is the need of bioconductor packages? Explain the features of bioconductor packages	(7)
3B)	Let U={1, 2, 3, 4, 5, 6, 7, 8, 9}, A={ 1, 2, 3, 4}, B={ 2, 4, 6, 8. Draw Venn diagrams. Verify De Morgan's laws.	(4)
i)		
ii)	How many words, with or without meaning can be made from the letters of the word WEDNESDAY, assuming that no letter is repeated if a) 4 letters are used at a time b) all letters are used at a time c) are letters are used with first letter is a vowel.	(3)
4A)	Solve the equations using Cramer's rule. x - y - 2z = 3; 2x + y + z = 5; 4x - y - 2z = 1.	(7)
4B)	Show that the following sequence is graphical. Also find a graph corresponding to the sequence 5, 1, 2, 5, 2, 4, 3, 2.	(7)

5) **Write short notes on the following:**

5A)	Using Logic Gates discuss AND and OR operations.	(3.5)
5B)	Solve the following equations by matrix method: 7x + 6y - 5z = 30; 3x - 4y + z = 0; x + 2y - 3z = 10.	(3.5)
5C)	"R is called dynamically typed language". Why? Explain the features of R statistical program.	(3.5)
5D)	Represent the graph shown below, with an incidence matrix.	(3.5)



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Question Paper

Exam Date & Time: 05-Jul-2023 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M.Sc. BIOINFORMATICS DEGREE EXAMINATION - JUNE/JULY 2023
SUBJECT: MBI 510 - IMAGE PROCESSING AND R PROGRAMMING
(OBE - 2021 REGULATION)

Answer ALL questions.
Illustrate where necessary

Marks: 70 **Duration: 180 mins.**

Answer all the questions.

1A)	"R is called dynamically typed language". Why? Explain the features of R statistical program.	(3.5)
1B)	**Explain the following:** 1. cat() 2. ls() 3. :operator 4. %in% operator 5. %*% operator 6. rm(list=ls()) 7. c() 8. seq()	(3.5)
1C)	What is the need for processing an image? List any four applications of digital image processing.	(3.5)
1D)	List the advantages of colour composite images.	(3.5)
2A)	Add a note on R data structures.	(7)
2B)	What are bioconductor packages? Explain the features of bioconductor packages.	(7)
2C)	Explain the components of image processing system.	(7)
2D)	Write a note on Resolution and quantization.	(7)
3)	Explain the fundamental steps in digital image processing.	(14)
4)	Add a note on imageJ user interface.	(14)

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