Printed Page:-04 **Subject Code:- ABT0403**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: IV - THEORY EXAMINATION (2024 - 2025)

Subject: Structural and Computational Biology

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

1-a. Transcription is performed in the presence of which enzyme? (CO1, K1) 1

(a) DNA polymerase

(b) RNA polymerase

(c) Both

(d) None

1-b. Which among these codon codes for the arginine? (CO1, K1) 1

(a) AGU

(b) AGC

(c) AGA

(d) AAC

1-c. What percentage (%) of the structures deposited into the PDB archive are based on NMR spectroscopy? (CO2, K1) 1

(a) 1

(b) 10

(c) 50

(d) 100

1-d. During NMR sample preparation the concentration ranges from……. (CO2, K1) 1

(a) 5µM to 50M

(b) 50μM to 500M
(c) 500μM to 5M
(d) 5μM to 500M

1-e. FRET is applied for the study of number of things except….....(CO3, K1) 1
(a) Protein-protein interactions
(b) Molecular dimerization
(c) Protein-DNA interactions
(d) Ligand binding to a receptor

1-f. In …..... technique, fluorescence of a sample is monitored as a function of time after excitation by a light pulse. (CO3, K1) 1
(a) Steady-state fluorescence spectroscopy
(b) Time-resolved fluorescence spectroscopy
(c) Steady-state and Time-resolved fluorescence spectroscopy
(d) None of these

1-g. Cellulose is made up of the molecules of…… (CO4, K1) 1
(a) β-D-Glucose unit
(b) α-D-Glucose unit
(c) Both (a) & (b)
(d) Neither (a) nor (b)

1-h. Amylose contains glucose……..units (CO4, K1) 1
(a) 100-200
(b) 200-300
(c) 300-400
(d) 400-500

1-i. A karyotype shows the complete ……set of chromosomes grouped together in pairs, arranged in order of decreasing size.(CO5, K1) 1
(a) haploid
(b) diploid
(c) both (a) & (b)
(d) neither (a) nor (b)

1-j. Simulation systems includes the following except……..(CO5, K1) 1
(a) discrete event simulation
(b) process simulation
(c) dynamic simulation
(d) non-discrete event simulation

2. Attempt all parts:-

2.a. Why we use D and L configuration in stereochemistry? (CO1, K2) 2

2.b. What is difference between soluble and membrane proteins? (CO2, K2) 2

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2.c.	What are the differences between solid state and solution state NMR? (CO3, K2)	2
2.d.	Define the terms interchain and intrachain. How they are different? (CO4, K2)	2
2.e.	How chromosomes are analyzed? (CO5, K2)	2

SECTION-B 30

3. Answer any five of the following:-

3-a.	Discuss the role of chaperons in protein folding? (CO1, K3)	6
3-b.	Explain how protein domains are different from protein motifs? Give example in support of your answer. (CO1, K3)	6
3-c.	Explain various zones that are present in supersaturated region during protein solubility. Also, draw the graphical plot between protein concentration and precipitation. (CO2, K3)	6
3-d.	Explain the effects of salting-in and salting-out on protein solution? Give your explanation with proper graphical representation. (CO2, K3)	6
3.e.	How X-ray crystallography is better than light microscopy and electron microscopy to study the atomic details of protein? Also, explain the steps to perform the X-ray crystallography. (CO3, K3)	6
3.f.	How α-Glucose and β-Glucose differ from each other. Explain. (CO4, K3)	6
3.g.	What are some of the difficulties in utilizing MD simulations to model protein dynamics, and how may these difficulties be overcome? (CO5, K3)	6

SECTION-C 50

4. Answer any one of the following:-

4-a.	Describe in detail, how amino acids plays an important role to define the different functions of the cells? (CO1, K3)	10
4-b.	Explain the importance of domain in protein structure? How protein domains differ from protein motif? (CO1, K3)	10

5. Answer any one of the following:-

5-a.	Define phase diagram. What are the difficulties usually encountered after changing the solution conditions? Also, explain the solubility curve. (CO2, K3)	10
5-b.	What is the purpose of using SDS-PAGE and Western Blot technique. Explain the methodology in detail. (CO2, K3)	10

6. Answer any one of the following:-

6-a.	Is there any differences between steady-state fluorescence spectroscopy and time-resolved fluorescence spectroscopy? Explain NMR spectroscopy. (CO3, K3)	10
6-b.	Explain the instrumentation, working and applications of any TWO of the following techniques: (CO3, K3) (a) Circular Dichroism (b) Electron Paramagnetic Resonance spectroscopy (c) Single molecule fluorescence.	10

7. Answer any one of the following:-

7-a.	Which is considered as important source of energy in human? Explain their features and significance. (CO4, K3)	10
7-b.	What do you understand by isomer, epimer and anomer? Explain with suitable examples. (CO4, K3)	10

8. Answer any <u>one</u> of the following:-

8-a.	How is DNA fingerprinting used to study genomes? Discuss in detail. (CO5, K3)	10
8-b.	Write a notes on structural and organization of genomes. (CO5, K3)	10

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