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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: V - THEORY EXAMINATION (2025 - 2026)

Subject: Artificial Intelligence in Biotechnology

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. Which of the following is the primary goal of Artificial Intelligence (AI)? (CO1, K1) 1
- (a) To simulate human intelligence in machines
- (b) To create physical robots
- (c) To replace human decision-making
- (d) To design faster computers
- 1-b. Who is known as the father of Artificial Intelligence? (CO1, K1) 1
- (a) John McCarthy
- (b) Alan Turing
- (c) Marvin Minsky
- (d) Geoffrey Hinton
- 1-c. Which data structure is used in Depth-First Search (DFS)? (CO2, K1) 1
- (a) Queue
- (b) Stack
- (c) Priority Queue
- (d) Array
- 1-d. In the A* algorithm, $f(n) = g(n) + h(n)$. What does $g(n)$ represent? (CO2, K1) 1
- (a) Estimated cost to the goal
- (b) Actual cost from start
- (c) Total nodes expanded so far
- (d) Remaining cost to the goal

- 1-e. What is the primary goal of data acquisition? (CO3, K1) 1
- (a) To visualize the data
 - (b) To collect relevant data
 - (c) To train the model
 - (d) To evaluate the model
- 1-f. What is the last phase in the AI project cycle? (CO3, K1) 1
- (a) Data Exploration
 - (b) Problem Scoping
 - (c) Data Acquisition
 - (d) Modeling
- 1-g. What is the purpose of sorting data in Excel? (CO4, K1) 1
- (a) To filter irrelevant data
 - (b) To create graphs
 - (c) To organize data alphabetically
 - (d) To highlight specific data
- 1-h. What is the main use of pivot tables in Excel? (CO4, K1) 1
- (a) To create charts
 - (b) To apply conditional formatting
 - (c) To summarize large datasets
 - (d) To filter data
- 1-i. What is the primary role of ML in bioreactor engineering? (CO5, K1) 1
- (a) Data collection
 - (b) Temperature prediction
 - (c) Process optimization
 - (d) Manual operation
- 1-j. How does AI help in bioenergy production? (CO5, K2) 1
- (a) Automating feedstock selection
 - (b) Manual calculations
 - (c) Reducing biomass moisture
 - (d) None of these
2. Attempt all parts:-
- 2.a. Build Model the problem formulations for Drug Discovery (Target–Compound Matching). (CO1, K3) 2
- 2.b. Define a heuristic function. (CO2, K1) 2
- 2.c. Explain the role of Modeling in the AI project cycle. (CO3, K2) 2
- 2.d. How does the Excel filter function help identify specific values in large datasets? (CO4, K2) 2
- 2.e. What is the purpose of QSAR modeling? (CO5, K1) 2

SECTION-B

30

3. Attempt all parts:-

3.a. Answer any <u>one</u> of the following:-	
3.a.(i) Provide two examples of how AI is being utilized in Biotechnology today. (CO1, K2)	6
3.a.(ii) Explain the role of algorithms in AI problem-solving, providing examples of commonly used search algorithms. (CO1, K2)	6
3.b. Answer any one of the following:-	
3.b.(i) What are key differences of Tree Search and Graph Search? How does Graph Search manage previously visited nodes to optimize the search process? (CO2, K2)	6
3.b.(ii) Summarize the limitations of tree search in cyclic graphs. (CO2, K2)	6
3.c. Answer any one of the following:-	
3.c.(i) How does iterative development impact the AI project cycle? (CO3, K2)	6
3.c.(ii) Summarize the steps involved in the project evaluation phase of the AI project cycle? (CO3, K2)	6
3.d. Answer any one of the following:-	
3.d.(i) How would you use Excel's sorting and filtering tools to identify top-selling products from a large dataset of product sales? (CO4, K2)	6
3.d.(ii) Discuss the limitations of sorting and filtering in Excel and when they might not be sufficient for complex data analysis. (CO4, K2)	6
3.e. Answer any one of the following:-	
3.e.(i) With the help of the problem statement and examples, how AI/ML uses in Protein Engineering (CO5, K2)	6
3.e.(ii) Discuss the Role of ML in Environmental Bioengineering.(CO5, K2)	6
<u>SECTION-C</u>	50
4. Answer any <u>one</u> of the following:-	
4-a. Define Artificial Intelligence (AI) and explain its importance in today's technological world. (CO1, K1)	10
4-b. Explain the difference between Artificial Intelligence, Machine Learning, and Deep Learning, with examples.(CO1, K1)	10
5. Answer any <u>one</u> of the following:-	
5-a. Explain the working mechanism of Depth-First Search (DFS) with suitable examples from state-space problems.(CO2, K2)	10
5-b. Explain the differences between Tree Search and Graph Search in AI search algorithms. (CO2, K2)	10
6. Answer any <u>one</u> of the following:-	
6-a. Explain the complete Artificial Intelligence Project Cycle and describe the role of each stage.(CO3, K2)	10
6-b. Interpret the importance of domain knowledge during problem scoping and data exploration.(CO3, K2)	10
7. Answer any <u>one</u> of the following:-	
7-a. How does conditional formatting improve data analysis and help users interpret large datasets more effectively? (CO4, K2)	10

- 7-b. Explain the difference between a bar chart and a line chart in Excel, and provide examples of when to use each type.(CO4, K2) 10
8. Answer any one of the following:-
- 8-a. Apply supervised learning techniques to classify biochemical compounds based on their properties.(CO5, K3) 10
- 8-b. Demonstrate the application of AI in designing experiments for biocatalyst development.(CO5, K3) 10

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