


Name:			
Enrolment No:			
UPES End Semester Examination, December 2024 Set 2			
Course: Artificial Intelligence and Bioinformatics Program: MSc. (Microbiology) and (Nutrition and Dietetics) Course Code: CSAI7021		Semester: 1st Duration: 3 Hours Max. Marks: 100	
Instructions: Read all questions carefully.			
S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	What is string slicing in Python? A) Accessing a portion of the string B) Removing characters from the string C) Converting a string to a list D) Combining two strings	1.5	CO2
Q 2	Who is considered the creator of Python? A) James Gosling B) Guido van Rossum C) Bill Gates D) Elon Musk	1.5	CO1
Q 3	How do you add an item to the end of a list in Python? A) list.append(item) B) list.add(item) C) list.insert(item) D) list.push(item)	1.5	CO2
Q 4	Which of the following is NOT a Python IDE? A) PyCharm B) Eclipse C) VS Code D) Notepad++	1.5	CO1
Q 5	What does the `range()` function do in Python? A) Generates a sequence of numbers B) Sorts a list of numbers C) Creates a random number D) Reverses a list	1.5	CO2
Q 6	What function is used to convert data from one type to another in Python? A) `convert()` B) `cast()`	1.5	CO3

	C) `str()` D) `int()`		
Q 7	Why is data variance important in AI? A) To reduce computing costs B) To ensure diverse learning experiences for the model C) To avoid errors D) To increase storage requirements	1.5	CO4
Q 8	Which of the following is an immutable data type in Python? A) List B) Set C) Tuple D) Dictionary	1.5	CO2
Q 9	How can you pass multiple arguments to a Python function? A) By using args B) By using *args C) By using +args D) By using &args	1.5	CO2
Q 10	Which loop is generally used when the number of iterations is not known beforehand? A) `for` loop B) `while` loop C) `do-while` loop D) `foreach` loop	1.5	CO3
Q 11	What is homology modeling? A. Predicting a protein structure from scratch B. Predicting a structure using known structures of similar sequences C. Predicting secondary structures only D. Predicting the DNA sequence of a gene	1.5	CO5
Q 12	Unsupervised Learning is used for: A. Predicting future values B. Clustering and pattern recognition C. Classification problems D. Reinforcement tasks	1.5	CO3
Q 13	One of the challenges of Unsupervised Learning is: A. The need for labeled data B. Difficulty in interpreting results C. Long training times D. Requires manual tuning	1.5	CO4
Q 14	What is the first step in the molecular docking process? A. Protein visualization B. Ligand binding C. Preparing the protein and ligand structures D. Homology modeling	1.5	CO5

Q 15	Which of the following is an example of Supervised Learning? A. K-means clustering B. Decision trees for classification C. Principal Component Analysis D. Hidden Markov models	1.5	CO3
Q 16	Which of the following is NOT a mode of AI? A) Weak AI B) Strong AI C) Reactive AI D) Passive AI	1.5	CO1
Q 17	Which sequence alignment tool is best known for database searches? A. BLAST B. Rasmol C. PDB D. CLUSTALW	1.5	CO5
Q 18	F1 Score is the harmonic mean of: A. Accuracy and Precision B. Precision and Recall C. Accuracy and Recall D. Recall and Specificity	1.5	CO4
Q 19	Which of the following uses AI to predict protein structures? A. BLAST B. GOR C. AlphaFold D. CLUSTALW	1.5	CO5
Q 20	Which of the following roles would best suit a non-IT major interested in Machine Learning? A. Data scientist B. Clinical data analyst C. Network engineer D. Software tester	1.5	CO5
Section B (4Qx5M=20 Marks)			
Q 1	Explain the difference between Python 2 and Python 3. Why was the transition to Python 3 significant in the programming community?	5	CO2
Q 2	What are the different data types and formats used in Machine Learning?	5	CO4
Q 3	Explain the application of AI-based protein structure prediction techniques such as AlphaFold in modern bioinformatics. How has AI improved the accuracy and speed of structure prediction?	5	CO5

Q 4	Write a short note on Python operators. Explain the use of arithmetic, comparison, and logical operators with examples.	5	CO3						
Section C (2Qx15M=30 Marks)									
Q 1	<p>Write a Python program that categorizes a list of ages into different groups: "Child," "Teenager," "Adult," and "Senior." The categorization is defined as follows:</p> <ul style="list-style-type: none"> • Child: age < 13 • Teenager: age >= 13 and age < 20 • Adult: age >= 20 and age < 65 • Senior: age >= 65 <p>List of ages = [5, 15, 22, 67, 12, 35, 8, 78, 19]</p> <p>Requirements:</p> <ol style="list-style-type: none"> 1. Create a list of ages with at least 8 different age values (2 Marks). 2. Use a for loop to iterate through the list of ages (2 Marks). 3. Implement if, elif, and else statements to determine the category of each age based on the criteria provided (3 Marks). 4. Print each age along with its corresponding category in a formatted manner (3 Marks). <p>Hint:</p> <pre style="background-color: #f0f0f0; padding: 10px;"># Step 1: Create a List of ages # Step 2: Iterate through the list of ages using For loop for item in list: # Step 3: Categorize each age using IF, Elif, and Else if condition 1: category = "Child" elif condition 2: category = "Teenager" elif condition 3: category = "Adult" else: category = "Senior" # Step 4: Print the age and its category print(f"Age: {age} - Category: {category}")</pre>	15	CO3						
Q 2	<p>A healthcare provider has implemented a model to predict whether patients have a particular disease based on symptoms. You are provided with the following dataset of actual and predicted disease statuses for 15 patients</p> <table border="1" data-bbox="363 1666 1059 1756" style="width: 100%; text-align: center;"> <thead> <tr> <th>Patient</th> <th>Actual Label (Disease Status)</th> <th>Predicted Label</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	Patient	Actual Label (Disease Status)	Predicted Label	1	1	1	15	CO5
Patient	Actual Label (Disease Status)	Predicted Label							
1	1	1							

	2	0	0			
	3	1	0			
	4	1	1			
	5	0	0			
	6	1	1			
	7	0	1			
	8	1	1			
	9	1	1			
	10	0	0			
	11	0	0			
	12	1	0			
	13	1	1			
	14	0	1			
	15	1	1			
Using this data:						
Construct the confusion matrix. (6 marks)						
Calculate the following metrics for the model:						
Accuracy (2 mark)						
Precision (2 marks)						
Recall (2 marks)						
F1 Score (3 mark)						
Show your calculations for each metric.						
Section D						
(2Qx10M=20 Marks)						
Q 1	Explain the concept of Artificial Intelligence (AI) and discuss the different modes and types of AI with relevant examples and how is it used today?				10	CO1
Q 2	Discuss the different types of Machine Learning: Supervised, Unsupervised, Reinforcement, Semi-supervised, and Self-supervised Learning. Provide examples for each.				10	CO4