

SCHEME OF EVALUATION

Scoring Indicators

TED (21) – 5133C
REVISION 2021

QID: 2109230302B

Reg. No.
Name:

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE

Fundamentals of Artificial Intelligence and Machine Learning

Time: 3 hours

Maximum Marks: 75

PART A

I. Answer all questions in one word or one sentence.

(9x1=9 Marks)

Q. No.	Scoring Indicators	Split Score	Sub Total	Total Score
1	Define artificial intelligence. An area of computer science that studies how machines can perform tasks that would normally require a sentient agent. An area of computer science that studies how machines can closely imitate human intelligence	1	1	9
2	Show an application of AI? Virtual Assistants (e.g., Siri, Alexa), Image Recognition (e.g., facial recognition), Natural Language Processing (NLP), Autonomous Vehicles, Healthcare Diagnostics, Recommendation Systems (e.g., Netflix recommendations), Fraud Detection, Robotics and Automation, Game AI (e.g., chess engines), Language Translation (e.g., Google Translate)	1	1	
3	Why Python is called as a high-level programming language? Python is called a high-level programming language because it abstracts complex low-level operations and provides a more user-friendly syntax and a higher level of abstraction, making it easier	1	1	

	for programmers to write code with a focus on problem-solving rather than low-level implementation details.		
4	List two basic data types in Python. Basic types - int, float, complex, bool, string, bytes	1	1
5	Define Lists in Python? In Python, lists are ordered collections of items that can hold elements of different data types, and they are defined by enclosing elements in square brackets []. Lists are mutable, meaning we can change their contents after creation.	1	1
6	Define machine learning. Machine learning is a subset of artificial intelligence that focuses on the development of algorithms and statistical models that enable computer systems to automatically improve their performance on a specific task through the analysis of data, without being explicitly programmed.	1	1
7	Tell the full form of SVM? The full form of SVM is "Support Vector Machine."	1	1
8	Compare chat bots and live chat? Chatbots, short for "chat robots," are computer programs or AI applications designed to simulate human conversation and interact with users through natural language, typically in text or speech form. They are used for a wide range of tasks, including customer support, information retrieval, and automation of conversations.	1	1
9	Explain the role of search algorithms in AI? Search algorithms are a fundamental component of many AI applications, and their primary purpose is to find a solution or make a decision by exploring a vast space of possible options or states.	1	1

PART B

II. Answer any 8 questions from the following.

(8x3=24 Marks)

1	<p>Summarize the learning of AI is “increasingly important” in today's job market?</p> <p>Learning AI is increasingly important in today's job market for several reasons:</p> <p>High Demand: There is a growing demand for AI professionals across various industries, including technology, healthcare, finance, and manufacturing. Businesses are integrating AI to enhance efficiency, make data-driven decisions, and gain a competitive edge.</p> <p>Automation: AI is automating routine tasks, leading to a shift in job roles. Those with AI skills can adapt to these changes and find opportunities to work alongside AI systems.</p> <p>Innovation: AI is driving innovation, creating new job roles in AI research, development, and implementation. Professionals skilled in AI can contribute to pioneering technologies and solutions.</p> <p>Data-Driven Decision-Making: AI enables organizations to analyze large datasets for insights and predictions. Professionals who understand AI can help organizations make informed decisions based on data.</p> <p>Global Adoption: AI is not limited to a specific region or industry. It is being adopted worldwide, creating a global demand for AI experts.</p> <p>Competitive Advantage: Businesses that leverage AI effectively can gain a competitive advantage, making AI expertise a valuable asset for job seekers.</p> <p>Evolving Technology: AI is a rapidly evolving field with continuous advancements. Professionals who keep up with AI developments remain relevant in the job market.</p>	3	3	
2	<p>Explain the different fields of AI</p> <p>Machine Learning, Natural Language Processing (NLP), Computer Vision, Robotics, Expert Systems, Reinforcement Learning, Neural</p>	3	3	

	Networks and Deep Learning, AI Ethics and Fairness, Cognitive Computing, AI in Healthcare			
3	<p>Explain dynamic data typing in Python with examples.</p> <p>Dynamic typing in Python means that the data type of a variable is determined at runtime, rather than at compile time. This flexibility allows variables to change their data type as needed, making Python a dynamically typed language.</p> <pre>x = 5 # Integer x = "Hello" # String x = 3.14 # Float</pre>	3	3	
4	<p>Demonstrate the repetition the execution of instructions in Python programming using loops.</p> <p>In Python, we can repeat the execution of instructions or code blocks using loops. There are two primary types of loops in Python: for loops and while loops.</p> <pre>for i in range(5): print(i) count = 0 while count < 5: print(count) count += 1</pre>	3	3	
5	<p>Demonstration insertion and accessing of elements in Lists.</p> <pre># Creating an empty list my_list = [] # Inserting elements into the list my_list.append(1) # Adding 1 to the list my_list.append("Hello") # Adding "Hello" to the list</pre>	3	3	

	<pre> my_list.append(3.14) # Adding 3.14 to the list # Printing the elements of the list print("Elements in the list:") for item in my_list: print(item) </pre>			
6	<p>Explain the object-oriented programming in Python?</p> <p>Object-oriented programming (OOP) is a programming paradigm that is supported by Python. In OOP, we design our code by modeling real-world entities as objects, which are instances of classes. Here are the key aspects of OOP in Python:</p> <p><u>Classes and Objects:</u></p> <p>In Python, classes are used to define blueprints for creating objects. A class is like a template that defines the attributes (variables) and methods (functions) that an object of that class will have. Objects are instances of classes. They are created based on the class definition and can have their unique data and behavior.</p> <p><u>Encapsulation:</u></p> <p>Encapsulation is the concept of bundling data (attributes) and methods that operate on that data into a single unit, i.e., a class. This helps hide the internal implementation details and provides a clear interface for interacting with objects.</p> <p><u>Inheritance:</u></p> <p>Inheritance allows us to create a new class by inheriting the attributes and methods of an existing class (base or parent class).</p> <p><u>Polymorphism:</u></p> <p>Polymorphism is the ability of objects of different classes to respond to the same method or function name in a way that is appropriate for their respective classes. It allows us to write more generic and reusable code.</p>	3	3	
7	<p>Explain classification and regression using supervised learning in machine learning with suitable examples.</p>	3	3	

	<p>In machine learning, <u>classification</u> is used to identify the category to which a new datapoint belongs. A classification model is built based on the training dataset containing datapoints and the corresponding labels.</p> <p>For example, let's say that we want to determine whether a given image contains a person's face or not. We would build a training dataset containing classes corresponding to two classes: face and no-face.</p> <p><u>Regression</u> is the process of estimating the relationship between input and output variables. One item to note is that output variables are continuous-valued real numbers. Hence, there are an infinite number of possibilities. This is in contrast with classification, where the number of output classes is fixed. The classes belong to a finite set of possibilities. In regression, it is assumed that the output variables depend on the input variables,</p> <p>so, we want to see how they are related. Consequently, the input variables are called independent variables, also known as predictors, and output variables are called dependent variables, also known as criterion variables. It is not necessary that the input variables are independent of one another; indeed, there are a lot of situations where there are correlations between input variables.</p>			
8	<p>Illustrate the binarization in data preprocessing.</p> <p>Binarization in data preprocessing involves converting numerical data into binary (0 or 1) format based on a specified threshold or condition. It is used in machine learning for several reasons:</p> <p>Simplifying Data: Binarization simplifies complex numerical data by reducing it to binary values, making it easier to process and analyze.</p> <p>Feature Engineering: Binarization is a form of feature engineering, where specific aspects of the data are transformed to better suit the</p>	3	3	

	<p>learning algorithm. It can help highlight important patterns or relationships in the data.</p> <p>Handling Non-Normal Data: Some machine learning algorithms assume that the input data follows a normal distribution. Binarization can be used to transform non-normally distributed data into a more suitable format for these algorithms.</p> <p>Dealing with Imbalanced Data: In classification tasks with imbalanced classes (where one class has significantly fewer samples than the other), binarization can be used to create balanced datasets by converting continuous variables into binary ones.</p> <p>Interpretability: Binary features are often more interpretable than continuous ones. They can represent clear "yes" or "no" conditions, which can be easier to understand and explain.</p> <p>Reducing Noise: Binarization can help reduce the impact of noisy data points or outliers, as extreme values are often thresholded to 0 or 1.</p>			
9	<p>Explain two common applications and advantages of deploying chatbots in customer service?</p> <p><u>Common Use Cases:</u> 24/7 Support, Frequently Asked Questions (FAQs), Appointment Scheduling, Order Tracking, Product Recommendations, Troubleshooting, Billing and Payments Feedback and Surveys</p> <p><u>Advantages:</u> Cost-Efficiency, Speed and Efficiency, Consistency, Scalability Availability, Data Collection, Multilingual Support, reduction in Wait Times, Human-Agent Collaboration, Enhanced User Experience</p>	3	3	
10	<p>How does AI enhance the gaming experience?</p> <p>Artificial Intelligence (AI) enhances the gaming experience in several ways, making games more engaging, challenging, and immersive. Here are some ways AI contributes to enhancing the gaming experience:</p>	3	3	

	Realistic Graphics, Natural Language Processing (NLP), Personalized Experiences, Player Behavior Analysis, Content Recommendation, Virtual Assistants etc.			
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PART C

Answer all the questions from the following. Each question carries 7 marks

(6x7=42 Marks)

	<p>Summarize the necessity of learning artificial intelligence.</p> <p>The necessity of learning artificial intelligence (AI) stems from its profound impact on various aspects of modern life, technology, and industry. Here are key reasons why learning AI is considered essential:</p> <p>Career Opportunities: AI is one of the fastest-growing fields, and it offers numerous career opportunities. Learning AI can open doors to high-demand job roles, from data scientists and machine learning engineers to AI researchers and developers.</p> <p>Industry Transformation: AI is transforming industries such as healthcare, finance, manufacturing, and retail. Professionals equipped with AI skills are better positioned to drive innovation, improve processes, and solve complex industry-specific problems.</p> <p>Automation: AI is automating routine tasks, which has implications across various sectors. Professionals need AI skills to work alongside AI systems, maintain them, and design new ones.</p> <p>Data-Driven Decision-Making: AI enables organizations to analyze vast datasets for valuable insights and predictions. Individuals proficient in AI can harness data to make informed decisions and solve complex problems.</p>			
III		7	7	

	<p>Global Adoption: AI technologies are being adopted globally. Learning AI ensures that individuals are part of a worldwide community focused on advancing AI applications and solutions.</p> <p>Competitive Edge: Businesses that leverage AI effectively gain a competitive advantage. Learning AI can help professionals contribute to organizations' success and innovation.</p> <p>Innovation: AI is at the forefront of technological innovation, powering advancements in fields like autonomous vehicles, natural language processing, and computer vision. Learning AI allows individuals to be at the cutting edge of innovation.</p> <p>Addressing Global Challenges: AI is being used to address complex global challenges, including healthcare, climate change, and energy efficiency. AI experts play a crucial role in finding solutions to these pressing issues.</p> <p>Interdisciplinary Applications: AI is highly interdisciplinary, blending elements of computer science, mathematics, neuroscience, and more. Learning AI fosters cross-disciplinary thinking and problem-solving skills.</p> <p>Personal Growth: Learning AI enhances cognitive abilities, critical thinking, and problem-solving skills. It challenges individuals to think creatively and adapt to evolving technologies.</p>			
	OR			
IV	<p>Describe how AI contributes to the automation of tasks in various sectors and its impact on efficiency and productivity.</p> <p>AI contributes significantly to the automation of tasks in various sectors, revolutionizing workflows, and enhancing efficiency and productivity. Here's how AI achieves this in different sectors: Manufacturing and</p>	7	7	

	<p>Robotics, Healthcare, Finance, Customer Service, Logistics and Transportation, Agriculture, Energy, Human Resources, Education etc.</p> <p><u>The impact of AI-driven automation includes:</u></p> <p>Efficiency: AI executes tasks with speed and accuracy, reducing errors and saving time.</p> <p>Productivity: Human workers can focus on more creative and high-value tasks, while AI handles repetitive chores.</p> <p>Cost Savings: Automation reduces labor costs and enhances resource allocation.</p> <p>Scalability: AI systems can scale effortlessly to handle increased workloads.</p> <p>Consistency: AI performs tasks consistently without fatigue or variations in quality.</p>			
V	<p>Explain various data types in Python. Imagine you are creating a program to manage student records for a school. How would you organize data using Python data types to store student names, ages, grades, and enrollment dates?</p> <p>Python supports 3 categories of data types:</p> <p>Basic types - int, float, complex, bool, string, bytes</p> <p>Container types - list, tuple, set, dict</p> <p>User-defined types - class</p> <p># Using a list of dictionaries to store student records</p> <pre>students = [{"name": "Alice", "age": 18, "grades": [92, 85, 78], "enrollment_date": "2023-09-01"}, {"name": "Bob", "age": 17, "grades": [88, 91, 76], "enrollment_date": "2023-09-05"}, {"name": "Charlie", "age": 19, "grades": [95, 89, 92], "enrollment_date": "2023-08-28"},]</pre>	7	7	
	OR			

VI	<p>Write a function that generates the first n terms of the Fibonacci sequence where $n \geq 0$. Explain your code.</p> <pre>def generate_fibonacci(n): # Check if n is less than 0 if n < 0: return "Invalid input. n must be a non-negative integer." # Initialize variables to store the first two terms of the sequence a, b = 0, 1 # Create a list to store the Fibonacci sequence fibonacci_sequence = [] # Generate the first n terms of the Fibonacci sequence for _ in range(n): fibonacci_sequence.append(a) a, b = b, a + b return fibonacci_sequence # Example usage: n = 10 # Change n to the desired number of terms result = generate_fibonacci(n) print(result)</pre>	7	7	
VII	<p>Explain how you can import a module from a Python package using an example</p> <p>In Python, we can import modules and their functions or classes to use them in our code. To import a module from a package, we typically use the import statement. There are several ways to import functions or classes from a module:</p> <p>Importing the Entire Module:</p> <p>We can import the entire module by using the import statement followed by the module name.</p>	7	7	

	<p>Example: <code>import module_name</code></p> <p>Importing Specific Functions or Classes:</p> <p>We can import specific functions or classes from a module using the <code>from</code> keyword.</p> <p>Example: <code>from module_name import function_name</code> or <code>from module_name import class_name</code></p> <p>Importing with an Alias:</p> <p>We can import a module or its functions/classes with an alias using the <code>as</code> keyword. This is helpful when dealing with long module names or to avoid naming conflicts.</p> <p>Example: <code>import module_name as alias_name, from module_name import function_name as alias_name</code></p> <p><code>import math</code> <code>result = math.sqrt(16) # Using the sqrt function from the math module</code></p>			
	OR			
VIII	<p>Illustrate the working of 'for' loop in Python with an example.</p> <p>The 'for' loop in Python is used to iterate over a sequence (such as a list, tuple, string, or other iterable objects) and perform a specific action on each element in the sequence. It allows us to execute a block of code repeatedly for each item in the sequence until the sequence is exhausted.</p> <p><code>numbers = [1, 2, 3, 4, 5]</code> <code>for num in numbers:</code> <code> print(num)</code></p>	7	7	
IX	<p>What is the SVM and what is its primary purpose in machine learning?</p> <p>A Support Vector Machine (SVM) is a powerful supervised machine learning algorithm used for classification and regression tasks. Its</p>	7	7	

	<p>primary purpose in machine learning is to find a hyperplane that best separates data points into different classes or to create a regression model that predicts continuous values. SVMs are particularly well-suited for classification tasks, where the goal is to categorize data points into one of two or more classes based on their features.</p> <p><u>The primary purposes of SVMs in machine learning are:</u></p> <p>Binary Classification: SVMs are widely used for binary classification problems, such as spam email detection, image recognition, and medical diagnosis.</p> <p>Multi-Class Classification: SVMs can be adapted to solve multi-class classification tasks effectively.</p> <p>Regression: SVMs can be applied to regression problems, such as predicting house prices or stock prices.</p> <p>Complex Decision Boundaries: SVMs are suitable for problems with complex, nonlinear decision boundaries, thanks to the kernel trick.</p>			
	OR			
X	<p>Explain scaling and normalization in data preprocessing.</p> <p>Scaling and normalization are two common data preprocessing techniques used to transform the features (variables) in a dataset to make them suitable for machine learning algorithms. These techniques help ensure that the features have similar scales and distributions, which can improve the performance of many machine learning algorithms.</p> <p>Scaling:</p> <p>Scaling involves transforming the features of a dataset so that they all have a consistent scale, typically between 0 and 1 or -1 and 1.</p> <p>Scaling is essential when features have different ranges, units, or magnitudes, as it can prevent certain features from dominating others during model training.</p>	7	7	

	<p>Common scaling methods include Min-Max scaling and Standardization (Z-score scaling).</p> <p>Min-Max Scaling: $X_{scaled} = (X - X_{min}) / (X_{max} - X_{min})$</p> <p>Standardization (Z-score Scaling): $X_{scaled} = (X - X_{mean}) / X_{std}$</p> <p>Normalization:</p> <p>Normalization is the process of rescaling features to ensure they have a similar scale and are centered around a common point, often the mean. Normalization is useful when features have different ranges or when the distribution of feature values is skewed.</p> <p>Common normalization methods include Z-score scaling and Min-Max normalization.</p> <p>Min-Max Normalization: $X_{normalized} = (X - X_{min}) / (X_{max} - X_{min})$</p>			
XI	<p>Explain any two leaning strategies in ML.</p> <p>Supervised Learning Unsupervised Learning Semi-Supervised Learning Reinforcement Learning Self-Supervised Learning Deep Learning etc.</p>	7	7	
	OR			
XII	<p>Explain the K-Means clustering algorithm.</p> <p>The K-Means clustering algorithm is a popular unsupervised machine learning technique used for partitioning a dataset into distinct,</p>	7	7	

	<p>non-overlapping clusters. It is widely used for clustering data points based on their similarity.</p> <p><u>Key Parameters:</u></p> <p>Number of Clusters (K): The most crucial parameter is the number of clusters we want to create in our data. Determining the appropriate value of 'K' can sometimes be challenging and may require domain knowledge or the use of methods like the Elbow Method or Silhouette Score.</p> <p>Initialization Method: The way initial centroids are chosen can affect the algorithm's convergence and results. Common initialization methods include random initialization and K-means++ initialization, which aims to distribute initial centroids more effectively.</p> <p>Distance Metric: The choice of distance metric (e.g., Euclidean distance, Manhattan distance, or other custom distance measures) impacts how the algorithm defines the similarity between data points.</p> <p>Convergence Criteria: We need to define the stopping criteria for the algorithm, such as the maximum number of iterations, a threshold for centroid changes, or a combination of both.</p>			
XIII	<p>Explain combinatorial Search Algorithms in AI.</p> <p>Combinational search algorithms in AI are a class of algorithms designed to solve problems involving combinations or permutations of elements from a given set. These algorithms are used to explore and analyze possible combinations of items to find a specific solution or achieve a particular goal. Combinational search algorithms play a crucial role in various AI applications, including optimization, decision-making, and puzzle-solving.</p>	7	7	
	OR			
XIV	<p>Explain Minimax Search Algorithms in AI.</p>	7	7	

<p>Minimax Algorithm in AI is a decision-making algorithm used in two-player games to find the optimal move for a player, assuming that the opponent also plays optimally. It is primarily used in turn-based games with perfect information, such as chess, checkers, or tic-tac-toe. The goal of the Minimax algorithm is to determine the best move for a player that maximizes their chances of winning or minimizes their chances of losing. Minimax is a foundational algorithm for game-playing AI and provides a systematic way to make decisions in adversarial settings. While it can handle deterministic games with perfect information, it does not account for uncertainty or incomplete information.</p>			
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