2023-24

Time - 3 hours

Full Marks - 60

*Answer **all parts** as per instructions.*
Figures in the right hand margin indicate marks.

PART – I

1. Answer all questions by choosing the correct answer from the given alternatives. [1 × 8

(a) What is the main objective of a rational agent ?

(i) To exhibit human-like behavior

(ii) To maximize its performance measure based on its percept sequence

(iii) To prioritize computational efficiency over effectiveness

(iv) To mimic human emotions

(b) What are the four main components of an intelligent agent ?

(i) Percept, actuator, controller, interpreter

(ii) Percept, actuator, decision maker, knowledge base

(iii) Percept, action, utility function, performan
sure

(iv) Percept, actuator, decision maker, learning al

(c) Which searching technique is commonly used fo
ing the shortest path in a graph ?

(i) Depth-first search (ii) Breadth-first searc

(iii) A* search (iv) Hill climbing

(d) In the A* search algorithm, what is the role of the eval
tion function ?

(i) To estimate the cost of reaching the goal from a give
state

(ii) To generate successor states

(iii) To evaluate the quality of the solution

(iv) To explore the state space

(e) In a constraint satisfaction problem (CSP), what are the
three main components ?

(i) Variables, constraints and goals

(ii) States, actions and costs

(iii) Initial state, successor function, and goal test

(iv) Rules, productions and control strategy

In first-order logic, what is a predicate ?

(i) A statement that assigns a truth value to a proposi-
tion

(ii) A symbol representing a property or relation that can
be true or false

(iii) A logical operator that connects two or more propo-
sitions

(iv) A variable representing an unknown quantity

(g) What is the Resolution Principle used for in logic ?

(i) To derive new facts from existing ones

(ii) To simplify complex logical expressions

(iii) To unify variables in a logical expression

(iv) To represent knowledge using semantic nets

(h) What is Bayesian inference used for in probabilistic rea-
soning ?

(i) To calculate probabilities of events based on prior
knowledge and observed evidence

(ii) To determine the truth value of logical propositions

(iii) To simplify complex logical expressions

(iv) To represent knowledge using semantic nets

PART – II

2. Answer any eight of the following questions within two sentences each. [2 × 8

(a) What is Rational Agent ?

(b) What dose Turing test mean ?

(c) What is the difference between depth-first search (DFS) and breadth-first search (BFS) ?

(d) What is frame ?

(e) Define heuristic search technique.

(f) Write different pitfalls of hill climbing search.

(g) Write the rules of inference in AI.

(h) Define NLP ?

(i) What is the need of probabilistic reasoning in AI ?

(j) What is fuzzy logic ?

PART – III

3. Answer any eight of the following questions within 75 words each. [2 × 8

(a) What are the different properties of environment.

(b) Define Min-Max algorithm.

(c) Write the different goals of AI.

Define Alpha-Beta Pruning.

[Write the differentiate between uniformed and informed search.

) What is conditional probability ?

(g) What are the conditions for unification ?

(h) What are semantic nets ?

(i) What are different techniques of knowledge representation ?

(j) What are the advantages of frame representation ?

PART – IV

*Answer **all** questions within 500 words each.*

4. Explain in details of learning agents with neat diagram. [6

OR

Explain different types of Intelligent agents and their structure. [6

5. What are the types of Hill Climbing algorithm ? Explain the features of Hill climbing.

OR

What is game playing ? Explain Alpha-Beta pruning algorithms with suitable example.

6. What is knowledge representation ? Discuss different types of knowledge. [6

OR

Explain semantic network with suitable example.

7. What do you mean by Probabilistic Reasoning ? Describe the need of probabilistic reasoning in AI. [6

OR

Discuss the role of Truth Maintenance system in AI.

No. of Printed Pages : 6

Sem-VI-UG-CompSc-CC-14(R&B)
(Algorithm Design Techniques)

2023-24

Time - 3 hours

Full Marks - 60

*Answer **all parts** as per instructions.*
Figures in the right hand margin indicate marks.

PART – I

1. Answer all questions by choosing the correct answer from the given alternatives. [1 × 8

(a) What is the primary principle behind the divide and conquer algorithm design paradigm ?

(i) To solve large problems by breaking them into smaller, more manageable subproblems

(ii) To solve problems by iterating through all possible solutions

(iii) To solve problems using recursion only

(iv) To solve problems using dynamic programming techniques

(b) Which of the following recurrence relations does the Master Theorem apply to ?

(i) $T(n) = T(n-1) + n$ (ii) $T(n) = 2T(n/2) + n$

(iii) $T(n) = n!$ (iv) $T(n) = \log n$

P.T.O.

(c) Which method is commonly used to solve recurrence relations ?

(I) Dynamic programming

(II) Divide and conquer

(III) Induction

(IV) Iteration

(d) Which searching algorithm requires the array to be sorted beforehand ?

(I) Linear Search (II) Binary Search

(III) Depth-First Search (IV) Breadth-First Search

(e) In which sorting algorithm does the "partition" step play a crucial role ?

(I) Bubble Sort (II) Insertion Sort

(III) Quick Sort (IV) Merge Sort

(f) What data structure is commonly used to implement Huffman coding ?

(I) Array (II) Linked List

(III) Binary Tree (IV) Stack

(g) What is the term used to describe the process of converting a key into an index in the hash table ?

(I) Hashing (II) Colliding

(III) Mapping (IV) Searching

(h) What is the time complexity of Depth-First Search (DFS) on a graph with V vertices and E edges ?

(I) $O(V)$ (II) $O(E)$

(III) $O(V + E)$ (IV) $O(V \times E)$

PART – II

2. Answer any eight of the following questions within two to three sentences each. [1½ × 8

(a) Define time complexity and space complexity in algorithm analysis.

(b) What is omega notation "Big O"(O) ?

(c) What is Hashing ?

(d) Write the time complexity for recurrence relation $T(n) = 7T\left(\frac{n}{2}\right) + n^2$ by using master method.

(e) What is linear probing ?

(f) Write the recurrence relation of merge sort algorithm and its time complexity.

(g) What is the difference between greedy approach and dynamic programming ?

(h) What are the steps of greedy algorithm ?

(i) What is spanning tree ?

(j) Write the representation of graph.

PART – III

3. Answer any eight of the following questions within 75 wo each. [2 x

(a) Write down the properties of asymptotic notations.

(b) What is pseudo-code ? Explain with an example.

(c) Solve the recurrence $T(n) = 100T\left(\frac{n}{99}\right) + n$ using master method.

(d) Find the LCS between 'SUBMIT' and 'COMMIT'.

(e) How does a greedy algorithm make decisions ?

(f) What is collision resolution in hashing?

(g) How is a spanning tree different from a minimum spanning tree ?

(h) What is the main idea behind Huffman coding ?

(i) How does Dijkstra's algorithm differ from Breadth-First Search (BFS) ?

(j) What problem does Matrix Chain Multiplication aim to solve ?

PART – IV

Answer all questions within 500 words each.

Solve the recurrence $T(n) = 2T\left(\frac{n}{2}\right) + n$ using substitution method. [6

OR

Solve the recurrence $T(n) = T\left(\frac{n}{10}\right) + T\left(\frac{9n}{10}\right) + n$ using recursion tree method.

Simulate Quick sort algorithm for the following example [6
25, 36, 12, 4, 5, 16, 58, 54, 24, 16, 9, 65, 78.

OR

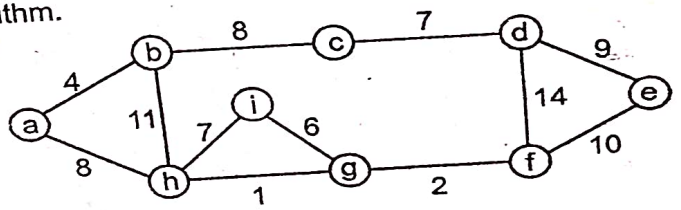
Write the algorithm of binary search and discuss its time complexity.

6. Determine on LCS of <submit> and <commit> . [6

OR

What is an optimal Huffman code for the following set of frequencies : a : 1, b : 1, c : 2, d : 3, e : 5, f : 8, g : 13, h : 21 ?

7. Find the minimum cost of the following graph using Kruskal algorithm. [6



OR

Discuss in detail about BFS algorithm with suitable example.

No. of Printed Pages : 6

2023-24

Time - 3 hours

Full Marks - 60

*Answer **all parts** as per instructions.*
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PART – I

1. Answer all questions by choosing the correct answer from the given alternatives. [1 × 8

(a) What is the Output of the following code in R ?

x ← c(1, 2, 3) y ← c (4, 5, 6) z ← x + y

(i) An error message

(ii) The vector [1, 2, 3, 4, 5, 6]

(iii) The vector [1, 4, 9]

(iv) The vector [5, 7, 9]

(b) Which of the following statements is True about missing values in R ?

(i) R automatically replaces missing values with the mean of the non-missing values.

(ii) R automatically removes observations with missing values from analyses.

(iii) Missing values are denoted by the character "NA

(iv) All of the above

(c) Data cleaning is ?

(i) Large collection of data mostly stored in a computer system

(ii) The removal of noise errors and incorrect input from a database

(iii) The systematic description of the syntactic structure of a specific database. It describes the structure of the attributes, the tables and foreign key relationships.

(iv) None of the these

(d) Which of the following functions in R can be used to calculate the standard deviation of a vector of numbers ?

(i) mean() (ii) median()

(iii) var() (iv) sd()

(e) Find out the correct statement ?

(i) The only way to exit a repeat loop is to call break

(ii) Infinite loops should generally be avoided

(iii) Control structures like if, while and for allow you to control the flow of an R program

(iv) All of the mentioned

(f) What is the primary purpose of Exploratory Data Analysis (EDA) in Data Science ?

(i) To make data more complicated

(ii) To simplify complex data

(iii) To discover patterns and insights in data

(iv) To visualize data

(g) Data science the process of diverse set of data through ?

(i) Organizing data (ii) Processing data

(iii) Analyzing data (iv) All of the above

(h) Which of the following is NOT a common EDA technique for visualizing data distributions ?

(i) Box Plot (ii) Histogram

(iii) Scatter Plot (iv) Bar chart

PART – II

2. Answer any eight of the following questions within two to three sentences each. [1½ × 8

(a) What does git pull do ?

(b) Write any two best version control systems in the today's market.

(c) What do you mean by Passive data ?

(d) What are the tools used in building data analysis s ware ?

(e) How many types of functions are in R language and d fine these types ?

(f) Write about lexical scoping and dynamic scoping.

(g) What is the difference between Raw data and Processe data in Data Science ?

(h) Define API with examples.

(i) What is the importance of R Studio ?

(j) What is Hypothesis ? Write the steps for strong hypothesis.

PART – III

3. Answer any eight of the following questions within 75 words each. [2 × 8

(a) What is Git Repository ?

(b) What is the difference between Machine learning and Data Science ?

(c) What is Data outlier ? Give examples.

(d) What is Code Profiling ?

(e) What does a Boxplot represent ?

(f) Write the various methods for accommodating multiple variables.

(g) What does a messy data mean ?

(h) Define data cleaning process in data science.

(i) When the sample is called Bimodal ?

(j) Write the R-syntax of while loop.

PART – IV

*Answer **all** questions within 500 words each.*

4. Why Git is a Distributed version control system ? Write the differences between Git and GitHub. [6

OR

Explain the reasons why one should learn Data Science ? Explain the phases of Data science process life cycle.

5. What are the different data types of R programming ? Write the different Control structures in R programming. [6

OR

What is Debugging ? Enlighten various Debugging functions in 'R'.

6. What is Tidy data ? How do you obtain data from application programming interface into R ? [6

OR

What are the basic functionalities of data cleaning and making tidy data ?

7. How do you define Exploratory data analysis ? What are the main areas needed to summarize a set of numbers ? [6

OR

What are the common Multivariate statistical methods for visualizing high-dimensional data ?