S.Y.B.Sc.(D.S.) – Semester III

DESIGN AND ANALYSIS OF ALGORITHMS

(Time: 2 hours)

Total Marks: 60

N. B.: (1) **All** questions are **compulsory**.
(2) Make **suitable assumptions** wherever necessary and **state the assumptions** made.
(3) Answers to the **same question** must be **written together**.
(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

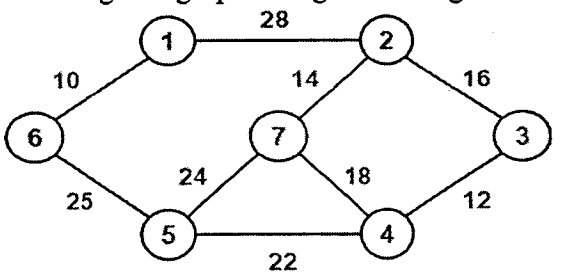
a. Explain the main goals of Object-Oriented Design.
b. Write differences between shallow copy and deep copy.
c. Write a short note on any two data structures.
d. What are Counter objects in Python? State their use.
e. Define asymptotic notations. Explain anyone.
f. Explain recursion with an example.

2. Attempt *any three* of the following: **15**

a. What is a doubly linked list? Explain its structure with a neat diagram and algorithm for creating it.
b. Explain the appending operation in a singly linked list with algorithm/diagram.
c. What is stack. Write the algorithm for implementing a stack using arrays.
d. What is a queue? Write the algorithm for enqueue and dequeue operations in a queue.
e. Explain the implementation of a queue using Python's list.
f. What is querying in a circular linked list? Explain with an example.

3. Attempt *any three* of the following: **15**

a. Define the following terms: root, leaf, degree, depth, and height of a tree.
b. Explain adjacency list representation of a graph with an example.
c. Explain the process of deleting node from BST having one child.
d. Write a short note on balancing trees.
e. Construct a max-heap from the following elements inserted one by one: 10,20,5,6,1,8,9,4
f. Find the MST of a given weighted graph using Prim's algorithm.



4. Attempt *any three* of the following: **15**

a. Explain how elements are stored in a hash table.
b. Explain open addressing as a collision resolution technique.
c. Explain the greedy strategy with a suitable example.
d. Explain divide and conquer with the help of visualization.
e. Explain the working of the Bubble Sort algorithm with an example.
f. What is a symbol table? State its importance in compilers.

S.Y.B.Sc.(D.S.) – Semester III

ROBOTIC ~~PROCESS~~ AUTOMATION PROCESS

(Time: 2 hours)

Total Marks: 60

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(5) Draw **neat labeled diagrams** wherever **necessary**.
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1. Attempt *any three* of the following: **15**

a. List benefits of RPA and explain any one in detail.
b. Identify two RPA components and briefly explain their functions.
c. Explain the importance of process assessment before RPA implementation.
d. Analyze the strengths and weaknesses of designing a workflow using only Sequences.
e. Evaluate with the help of an example how Do While and For Each loops works in UiPath.
f. Create a decision-making logic in UiPath to check if a user login is successful. What activities will you use and why?

2. Attempt *any three* of the following: **15**

a. Explain how the scope of a variable affects its accessibility in a workflow.
b. Differentiate between variables and arguments with suitable example.
c. Design a small workflow to read data from Excel, manipulate it using a data table, and save it back to CSV
d. Recall the types of extensions UiPath supports for browser automation.
e. Analyze a case which discusses importance of credential management
f. Develop a guide for installing and configuring all required UiPath extensions for Chrome, Firefox, and Java.

3. Attempt *any three* of the following: **15**

a. What are Assistant Bots in UiPath, and where are they commonly used?
b. Illustrate how monitoring emails can be automated using UiPath triggers.
c. Critique a scenario where too many triggers are used in a workflow. What problems can it create?
d. List any three common exceptions that may occur in UiPath workflows.
e. Define different debugging techniques and breakpoints.
f. Differentiate between Throw, Re-throw and Try-catch block

4. Attempt *any three* of the following: **15**

a. List the three main workflow types in UiPath and give one use case for each.
b. Analyze how the absence of comments can lead to confusion during workflow handover.
c. List any three best practices for organizing a UiPath project folder.
d. Explain the step-by-step process of publishing a workflow using the Publish utility.
e. Explain how Orchestrator helps in managing robots and processes.
f. What are the different types of robots that can be controlled using Orchestrator?

S.Y.B.Sc.(D.S.) – Semester III

DATA WAREHOUSING

(Time: 2 hours)

01/10/2025 **Total Marks: 60**

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(4) Numbers to the **right** indicate **marks**.
(5) Draw **neat labeled diagrams** wherever **necessary**.

1. Attempt *any three* of the following: **15**

a. Explain the Purpose and Importance of Data Warehousing.
b. Explain the following key Characteristics of a Data Warehouse
1. Subject-oriented 2. Time-Variant
c. Write a short note on the concept of a Dependent Data Mart for Customer Data.
d. State the difference between OLTP and OLAP.
e. Explain Data Modeling for Data Warehousing?
f. Discuss the Layer Architecture of the Data Warehouse.

2. Attempt *any three* of the following: **15**

a. Explain Normalization in Data Warehousing with an example.
b. Write steps include in creation of Galaxy Schema using following schema
Fact Tables: Sales_Fact, Shipping_Fact.
Shared Dimension Table: Time_Dim, Product_Dim, Customer_Dim
c. Define Hierarchies Dimension Tables.
d. Write a short note on implementing a junk dimension with an example.
e. Discuss SCD with its Types 2.
f. What is the Foreign Key concept in the Fact table? Explain with an example.

3. Attempt *any three* of the following: **15**

a. Explain Bulk Loading with an example.
b. Differentiate between Incremental Loads and Full Loads.
c. Explain Staging process with following ETL phase using Employee Table
1.Extract 2.Transform 3. Load
d. Explain the Filtering technique used in the data warehouse with an example.
e. Write a short note on the SSIS Platform.
f. Define the Data Cleansing component in the ETL Pipeline.

4. Attempt *any three* of the following: **15**

a. Define the Hybrid Approach used for designing a data warehouse.
b. Define the OLAP cube with the following factors
1. Structure 2. Dimensions
c. Discuss ROLAP with an example.
d. Write a short note on Techniques for Securing Data.
e. Explain Data Partitioning? write a partition query based on a column like Date.
Table name: Product_info
Column:
Product_id, Date, Region, Product_name, Units_Sold, Revenue
f. What kind of security challenges are available in a Data warehouse?

S.Y.B.Sc.(D.S.) – Semester III

BASICS OF PROBABILITY

(Time: 1 hour)

Date 11/10/2025

Total Marks: 30

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(5) Draw **neat labeled diagrams** wherever **necessary**.
(6) Use of **Non-programmable** calculators is **allowed**.

1. Attempt *any three* of the following: **15**

a.

i) Define Union of two sets and give one example.
ii) Define Intersection of two sets and give one example.
iii) When do you say two sets are mutually disjoint. Give one example.
iv) Define Relative difference. Give one example.
v) Define Complement of a set and give one example.

b. Consider the universal set $\mathbb{U} = \{1,2,3,\ldots.,8,9\}$ and sets $A = \{2,4,6,8\}, B = \{1,3,5,7\}, C = \{1,3,6,9\}$ Find $C \cup B,\ A \cap B, C - A, C^c \cup A^c, (A \cup B) - c.$

c. Let $A = \{1,2,\ldots.,8,9\}, B = \{3,4,5\}, C = \{3,5\}, D = \{2,4,6,8\}, E = \{1,3,5,7,9\}.$ Which of these sets can equal a set X under each of the following conditions.

a. X and B are disjoint.
b. $X \subseteq A$ but $X \not\subset C.$
c. $X \subseteq D$ but $X \not\subset B.$
d. $X \subseteq C$ but $X \not\subset A.$

d. Define following terms and give one example for each.
Outcome, Sample space, Event, Equally likely outcomes, Favorable outcomes.

e. Give Mathematical definition of probability and justify which of the following defines a probability space on $S = (e_1, e_2, e_3)$

i) $P(e_1) = -\frac{1}{3}, P(e_2) = \frac{1}{3}, P(e_3) = \frac{1}{3}.$
ii) $P(e_1) = 0, P(e_2) = \frac{1}{3}, P(e_3) = \frac{1}{2}.$
iii) $P(e_1) = -\frac{1}{4}, P(e_2) = \frac{1}{3}, P(e_3) = \frac{1}{2}.$
iv) $P(e_1) = \frac{1}{3}, P(e_2) = \frac{1}{3}, P(e_3) = \frac{1}{3}.$

f. Two dice, one green and the other red, are thrown. Let A be the event that the sum of the points on the faces shown is even and B be the event that the sum of the points on the faces shown is odd. Describe: Complete sample space, Events $A \cap B, \overline{(A \cup B)}, (\bar{A} \cup B), A \cup (\bar{A} \cap B)$ and find their probabilities.

2. Attempt *any three* of the following: **15**

a. State and prove Baye's Theorem.

b. Two dice, one green and the other red, are thrown. Let A be the event that the sum of the points on the faces shown is even and B be the event that the sum of the points on the faces shown is odd. Describe: Complete sample space, Events $(A|B), (B|A), (\bar{A}|\bar{B}), (\bar{B}|\bar{A})$ and find their probabilities.

c. The contents of urns I, II, III are as follows:
1 white, 2 Black and 3 Red balls,
2 white, 1 Black and 1 Red balls,
4 white, 5 Black and 3 Red balls.
One urn is chosen at random and two balls are drawn. They happen to be white and red. What is the probability that they come from urns I, II, or III.

d. Let A and B be two events such that $P(A) = \frac{3}{4}$ and $P(B) = \frac{5}{8}$. Show that $P(A \cup B) \geq \frac{3}{4}$ and $\frac{3}{8} \leq P(A \cap B) \leq \frac{5}{8}$.

e. A problem in statistics is given to three students A, B and C whose chances of solving are 1/2,1/4 and 1/4 respectively.
What is the probability that the problem will be solved if all of them try independently?

f. A card is drawn from a well-shuffled deck of 52 cards. Find the probability that it is:
A King, given that it is a face card,
A spade, given that it is black.

S.Y.B.Sc.(D.S.) – Semester III

DATA VISUALIZATION

(Time: 2 hours)

Total Marks: 60

N. B.: (1) All questions are compulsory.
(2) Make suitable assumptions wherever necessary and state the assumptions made.
(3) Answers to the same question must be written together.
(4) Numbers to the right indicate marks.
(5) Draw neat labeled diagrams wherever necessary.
(6) Use of Non-programmable calculators is allowed.

1. Attempt *any three* of the following: 15

a. Draw and explain Business Intelligence architecture.
b. What is the role of mathematical models in Business Intelligence?
c. What is Business Intelligence, and what is its purpose in decision-making?
d. What are the main components of a DSS?
e. Describe different phases in the development of a decision support system (DSS).
f. Explain Rapid Prototyping approach for Decision Support System (DSS).

2. Attempt *any three* of the following: 15

a. Explain the concept of mathematical model according to their characteristics, probabilistic nature, and temporal dimension.
b. What is a mathematical model in decision making?
c. What is data reduction?
d. Why is data discretization considered a primary method of data reduction?
e. Explain unsupervised learning with a suitable example.
f. What is the role of data distribution in machine learning?

3. Attempt *any three* of the following: 15

a. Explain Taxonomy of classification model.
b. Write a short note on confusion matrix.
c. In a fruit dataset, 30 apples and 70 oranges are recorded. Among apples, 15 are red; among oranges, 10 are red. Using Bayesian classification, find the probability that a red fruit is an apple.
d. Explain the concept of k-means algorithm for Clustering.
e. Explain agglomerative hierarchical clustering with a suitable example.
f. Solve the following using the K-means algorithm, considering the 3rd and 7th elements as the initial centroids for K = 2 clusters.
Data: {3, 4, 10, 11, 12, 20, 23, 25, 28, 30}

4. Attempt *any three* of the following: 15

a. What is a Management Information System (MIS)? Explain its objectives.
b. What are the key attributes of high-quality information in MIS?
c. Define Relational Marketing and explain the environment for its analysis.
d. Explain the term customer retention in relational marketing.
e. What is supply chain optimization, and why is it important in logistics management?
f. Explain the "tactical planning" optimization model for logistics planning.

S.Y.B.Sc. (D.S.) NEP – Semester III
Entrepreneurship Management
(Time: 1 hour) 14/10/2025 **Total Marks: 30**

1. Attempt *any three* of the following: **15**

a. Explain briefly the barriers to entrepreneurship.
b. Discuss in brief the factors affecting entrepreneurial management
c. Explain in brief the development of business plan
d. Write a note on Theory of Social change
e. What is socio cultural influence on entrepreneurial development?
f. Write a note on Incubation Centre

2. Attempt *any three* of the following: **15**

a. Describe in brief problems of women entrepreneurs
b. Discuss the importance of social entrepreneurship
c. Explain shortly the options available to entrepreneurs
d. What are the factors influencing Entrepreneurship Development Program?
e. Discuss the different types of Intellectual Property Rights
f. What are the strategies for growth of Entrepreneurship?