MANGALORE UNIVERSITY

National Education Policy – 2020
[NEP-2020]

QUESTION BANK

OF

DSC13-Design & Analysis of Algorithms
DSC14-Statistical Computing and R Programming
DSC15-Software Engineering

FOR

V SEMESTER BCA

Design & Analysis of Algorithms

UNIT 1

TWO MARKS QUESTIONS

1. What is an Algorithm? What are the criteria for writing an algorithms?
2. What are the methods of specifying an algorithms?
3. List the steps of Algorithm design and analysis process
4. What is exact algorithm and approximation algorithm? Give example.
5. List the important Problem Types.
6. Define the different methods for measuring algorithm efficiency.
7. Write the Euclid algorithm to find the GCD of 2 numbers.
8. What are combinatorial problems? Give an example.
9. What are following data structures?
    a) Single linked list
    b) double linked list
    c) stack
    d) queue
    e) graph
    f) tree
10. Explain the terms (w.r.t graph):
    a) Directedgraph
    b) undirected graph
    c) adjacency matrix
    d) adjacency lists
    e) weighted graph
    f) path
    g) cycle

11. Explain the terms (w.r.t trees)
    a) free tree
    b) forest
    c) rooted tree
    d) ordered tree
    e) binary search tree

12.Define Sets and Dictionaries.

13. Define the two types of efficiencies used in algorithm.

14.What are Best case and Worst case in algorithm?

15. Why order growth necessary in algorithm analysis?

16. What are asymptotic notation? Why it is required?

17.Find the time complexity for given algorithms

Statement

void Add(Type a[][SIZE], ...)
{ for (int i=1; i<=m; i++)
for (int j=1; j<=n; j++)
c[i][j] = a[i][j]
+ b[i][j];
}

18.What is Big O notation? Give an example

19.What is Big Omega notation? Give an example

20.Define Big Theta notation. Give an example

21.Define Little Oh notation. Give an example

22.What is recurrence relation? Give an example.

23.Prove the followingstatements.

a) $100n + 5 = `O(n2)$

b) $n^2 + 5n + 7 = \Theta(n^2)$

c) $n^2 + n = O(n^3)$

d) $\frac{1}{2} n(n-1) = \Theta(n^2)$

e) $5n^2 + 3n + 20 = O(n^2)$

f) $\frac{1}{2}n^2+3n = \Theta(n^2)$

g) $n^3 + 4n^2 = \Omega(n^2)$

24.Algorithm Sum(n)

S ← 0

For i← 1 to n do

S ← S + i

Return S

a) What does this algorithm compute?

b) What it its basic operation?
c) How many times is the basic operation executed?
d) What is the efficiency class of this algorithm?

Long Answers Questions (THREE, FOUR OR FIVE Marks Questions)

1. What is an Algorithm? Explain the various criteria for writing an algorithms with example?
2. Explain Euclid Algorithm with example to find the GCD of two numbers.
3. Explain Consecutive integer checking methods of find the GCD of two numbers.
4. Explain Algorithm design and analysis process with flow diagram.
5. Explain any FIVE Problem types.
6. Explain following
    a. Graph problem
    b. Combinatorial problems
    c. Geometrical problems.
7. Explain the fundamentals of data structure.
8. Write a note on Graph data structure.
9. Write a note on following data structures.
    a. Tree
    b. Sets
    c. Dictionary
10. Explain Space complexity and Time complexity with example.
11. Write an algorithm find sum of two matrixes also calculate its time complexity.
12. Write an algorithm find the sum of n numbers also calculate its space and time complexity.
13. Explain the following w.r.t algorithm efficiency.
    a. Measuring input size
    b. Unit for measuring the run time
    c. Order growth
14. Explain Worst case, Best case and average case with example
15. Write an algorithm to perform sequential search and also calculate its Worst case, Best case and average case complexity.
16. Explain Big O notation with example.
17. Explain Big Omega notation with example.
18. Explain Big Theta notation with example.

19. Explain asymptotic notations Big O, Big Ω and Big θ that are used to compare the order of growth of an algorithm with example.
20. Define Big O notation and prove
    a) $100n + 5 = O(n^2)$
    b) $5n^2 + 3n + 20 = O(n^2)$
    c) $n^2+n = O(n^3)$
    d) $3n+2=O(n)$
    e) $1000n^2+100n-6=O(n^2)$

16. Define Big Omega notation and prove
    a) $n^3 \in \Omega(n^2)$
    b) Prove that $2n + 3 = \Omega(n)$
    c) $\frac{1}{2}n(n-1) \in \Omega(n^2)$.
    d) Prove that $n^3 + 4n^2 = \Omega(n^2)$

17. Define Big Theta notation and prove
    a) $n^2+5n+7 = \Theta(n^2)$
    b) $1/2n^2 +3n = \Theta(n^2)$
    c) $\frac{1}{2}n(n-1) \in \Theta(n^2)$.

18. Explain with example mathematical analysis of non-recursive algorithm.
19. Write an algorithm to Find the largest element in an array and also perform mathematical analysis.
20. Write an algorithm to Checking for Unique elements in an array and also perform mathematical analysis.
21. Write an algorithm to perform matrix multiplication and also perform mathematical analysis.
22. Write anon-recursive algorithm to Count the number of bits in a number. And also perform mathematical analysis.
23. List the steps for analyzing the time efficiency of recursive algorithm.
23. Explain with example mathematical analysis of recursive algorithm.
24. Write an algorithm to find the factorial of a number using recursion and also perform mathematical analysis.
25, Write an algorithm to perform Towers of Hanoi using recursion and also perform mathematical analysis.

26. State the recursive algorithm to count the **bits of a decimal number** in its binary representation. Give its mathematical analysis.

27.Consider the following algorithm.

```
Algorithm GUESS (A[ ] [ ])
for i ← 0 to n – 1
    for j ← 0 to i
        A [i] [j] ← 0
```

i) What does the algorithmcompute?

ii)What it its basic operation?

iii) What is the efficiency of thisalgorithm?

27. Solve the following recurrence relation.

a) x(n) = x(n-1) + 5 for n >1 , x(1) =0

b) x(n) = 3x(n-1) for n > 1 x(1)=4

c).x(n)=x(n-1)+n for n>1 x(0)=0

28. Find the time complexity of below algorithm.

```
algorithm Fibonacci(n)
{
  if n <= 1 then
    output 'n'
  else
    f2 = 0;
    f1 = 1;

    for i = 2 to n do
    {
      f = f1 + f2;
      f2 = f1;
      f1 = f;
    }
    output 'f'
}
```

Unit 2

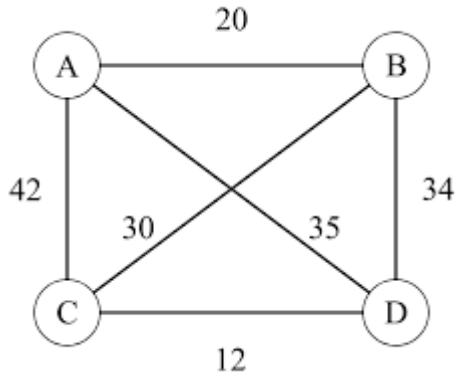
2 marks Questions

1. What is Brute force approach of problem solving? Give a example.
2. List any four importance of Brute force.
3. Write the number of operations and time complexity of selection sort.
4. Write the number of operations and time complexity of bubble sort.

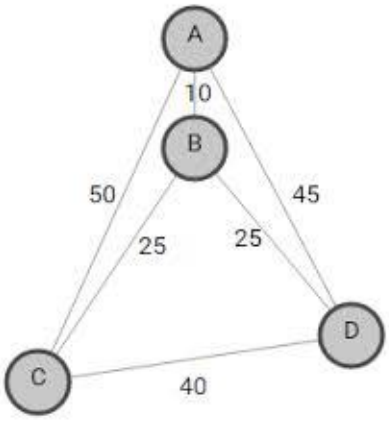
5. What do you mean by Sequential Search? Write its time complexity
6. Write the worst case and average case complexity of Brute force String Matching.
7. Write the number of operations and time complexity of Closest-Pair Problem.
8. Define Convex and Convex hull.
9. List any two example algorithms of the brute force approach.
10. What do you mean by convex hull problem? Write its time complexity
11. Define Exhaustive search.mechansim.Give example.
12. What do you mean by Knapsack Problem? Write its time complexity
13. What do you mean by Travelling Salesman Problem? Write its time complexity.
14. What do you mean by Job assignment problem? Write its time complexity.

Long Answer Questions **(THREE, FOUR OR FIVE Marks Questions)**

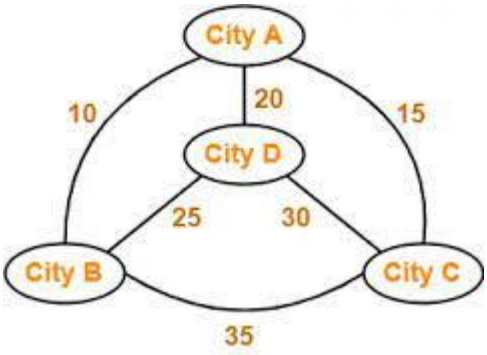
1. Write an algorithm to sort N numbers using Selection sort. Derive the number of operations and time complexity.
2. Write an algorithm to sort N numbers by applying Bubble sort. Derive the number of operations and time complexity.
3. Write and describe the Sequential search algorithm.
4. Write and describe Brute force String Matching Algorithm.
5. Write and explain the algorithm for Closest-Pair Problem. Derive its complexity.
6. Write and explain the algorithm for Convex Hull problem.
7. .Explain Travelling Salesman Problem by exhaustive search with an example.
8. Write a note on Knapsack Problem with an example.
9. Find the optimal solution for the Traveling Salesman problem using exhaustive search method by considering 'A' as the starting city.



10. Find the optimal solution for the Traveling Salesman problem using exhaustive search method by considering 'C' as the starting city.



11. Find the optimal solution for the Traveling Salesman problem using exhaustive search method by considering 'City D' as the starting city.



12. Consider the Knapsack problem with the following inputs. Solve the problem using exhaustive search. Enumerate all possibilities and indicate unfeasible solutions and Optimal solution. Knapsack total capacity W=15kg

Items	A	B	C	D
Weight(kg)	3	5	4	6
Value	36	25	41	34

13. Consider the Knapsack problem with the following inputs. Solve the problem using exhaustive search. Enumerate all possibilities and indicate unfeasible solutions and optimal solution. Knapsack total capacity W=20kg

Items	Item1	Item2	Item3	Item4
Weight	8	10	7	4
Value	40	45	65	30

14. Consider the Job Assignment problem with the following inputs. Solve the problem using exhaustive search.Calcualte Minimal total cost to complete to all jobs one job by each person

	JOB1	JOB2	JOB3	JOB4
Person-1	9	2	7	8
Person-2	6	4	3	7
Person-3	5	8	1	8
Person-4	7	6	9	4

15. Consider the Job Assignment problem with the following inputs. Solve the problem using exhaustive search.Calcualte Minimal total cost to complete to all jobs one job by each person

	JOB1	JOB2	JOB3
Person-1	9	2	7
Person-2	6	4	3
Person-3	5	8	1

Unit 3

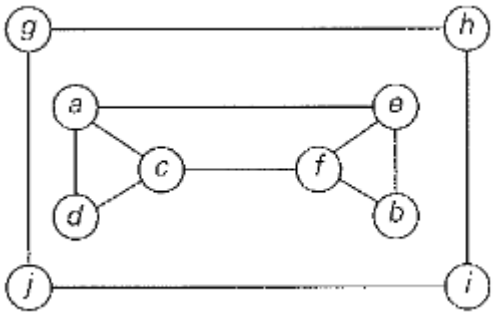
2 marks Questions

1. Define decrease and conquer technique and list any two of its variations.
2. What is a decrease by a constant technique and give an example.
3. What is a decrease by a constant factor technique and give an example.
4. What is a variable size decrease technique and give an example.
5. Write the time complexity for worst, best and average case of Insertion sort.
6. Give any four comparisons among Depth First Search and Breadth First Search.
7. Define digraph and dag.
8. Write an algorithm to find height of Binary tree.
9. Write the recurrence relation for Binary tree.
10. Define Topological sorting. Give an example.
11. Define following
    a. Tree Edge
    b. Cross Edge
    c. Back Edge
12. List the Two algorithms for solving topological sorting problem.
13. Define decrease-by-one technique in topological sorting.
14. Define divide and conquer technique and list its steps.

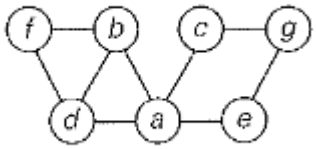
15. Give the structure of Recurrence equation for Divide and Conquer.
16. Write the time complexity for Merge and Quick sort
17. Write the time complexity for Strassen'sMatrix Multiplication and Multiplication Larger integer.
18. State Mater theorem of Divide and conquer.
19. Write the time complexity for worst, best and average case of Binary Search.
20. Write the steps followed in divide and Conquer approach.

Long Answer Questions **(THREE, FOUR OR FIVE Marks Questions)**

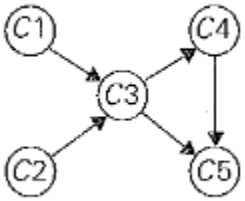
1. Write an algorithm to sort N numbers using Insertion sort. Derive the time complexity for worst case and best case.
2. Define decrease and conquer technique and explain its variations.
3. Write and explain Depth-First Search Algorithm with example
4. Write and explain Breadth-First Search Algorithm with example
5. Consider the following graph and perform following traversal and also draw the TREE.
    a. BFS
    b. DFS



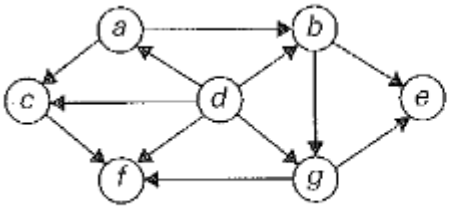
6. Consider the following graph and perform following traversal also draw the TREE.
    a. BFS
    b. DFS



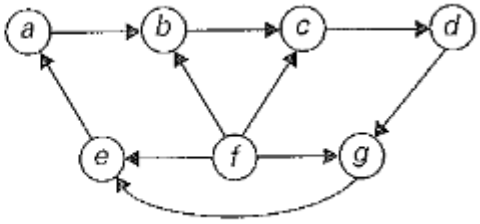
7. Give any five comparisons among Depth First Search and Breadth First Search.
8. Write a note on topological sorting with an example.
9. Explain DFS-based algorithm to solve the topological sorting problem and also write topological order for below graph.



10. Apply the DFS-based algorithm to solve the topological sorting problem for the following digraphs

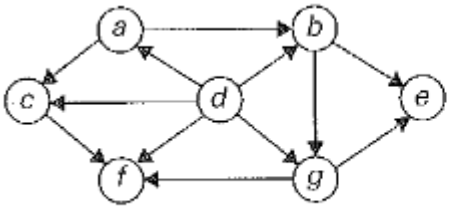


(a)

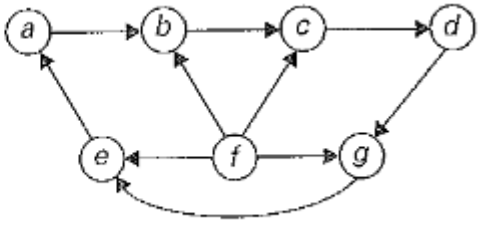


(b)

11. Apply the source-removal (Decrease by one) algorithm to solve the topological sorting problem for
the following digraphs

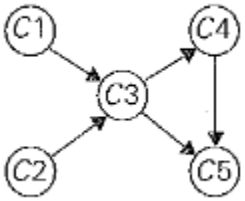


(a)



(b)

12. Explain source-removal (Decrease by one) algorithm to solve the topological sorting problem and also write topological order for below graph



13. Explain divide and conquer technique of solving problem with diagram.
14. Solve the recursion relation using Master theorems

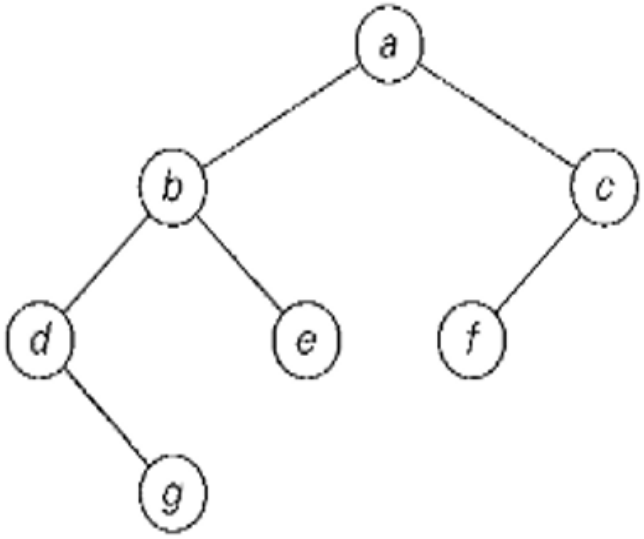
$T(n) = 2T(n/2) + n$

T(1)=2

15. Solve the recursion relation using Master theorems.

$$A(n) = 2A(n/2) + 1.$$

16. Write an algorithm to sort N numbers using Merge sort. Derive the time complexity.
17. Write an algorithm to sort N numbers using Quick sort. Derive the time complexity.
18. Write an algorithm to find maximum and minimum element in array Derive the time complexity.
19. Write an algorithm to search an element in an array of N numbers using Binary search. Derive the time complexity.
20. Traverse the Binary Tree a)Inorder b)Preorder c)Postorder



21. Explain the Strassen's algorithm of matrix multiplication and derive the time complexity.
22. ApplyStrassen's algorithm to multiply two Matrixes.

$$\begin{bmatrix} 3 & -1 \\ 2 & 4 \end{bmatrix} \times \begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix}$$

23. Compute 1234 x 2526 usingdivide and conquer approach for the multiplication of two large numbers.
24. Explain the Multiplication two larger integer usingdivide and conquer approach and derive the time complexity.
25. Compute 34 x 26 using divide and conquer approach for the multiplication of two large numbers.
26. Apply Strassen's algorithm to compute exiting the recursion when n = 2, i.e., computing the products of 2-by-2 matrices by the brute-force algorithm.

$$\begin{bmatrix} 1 & 0 & 2 & 1 \\ 4 & 1 & 1 & 0 \\ 0 & 1 & 3 & 0 \\ 5 & 0 & 2 & 1 \end{bmatrix} * \begin{bmatrix} 0 & 1 & 0 & 1 \\ 2 & 1 & 0 & 4 \\ 2 & 0 & 1 & 1 \\ 1 & 3 & 5 & 0 \end{bmatrix}$$

Unit 4

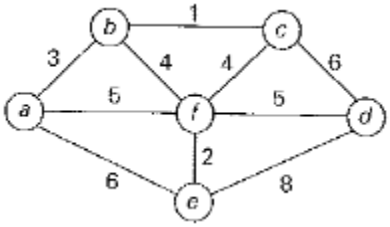
2 marks Questions

1. What is Greedy problem? List requirements of the solution at each step in greedy approach.
2. Differentiate between Prim’s and Kruskal’s Algorithm.
3. What is the Prim’s algorithm? How it works?
4. What is the approach to solve a problem using Kruskal’s algorithm.
5. What is the approach to solve a problem using Dijkstra’s algorithm.
6. Write the Complexity of Kruskal’s and Prism Algorithms.
7. Define spanning tree and minimum spanning tree.
8. What is dynamic Huffman encoding?
9. Differentiate fixed length encoding and variable length encoding in Huffman tree.
10. Define Huffman tree and Huffman code.
11. What is lower bound Arguments?

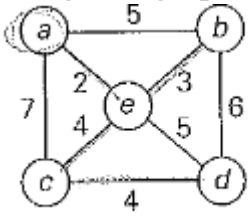
12. What are P problems? Write example.
13. What are NP problems? Write example.
14. What are NP Complete problems? Write example.
15. What are Decision Trees? Draw the Decision tree for Maximum of two numbers.

Long Answer Questions **(THREE, FOUR OR FIVE Marks Questions)**

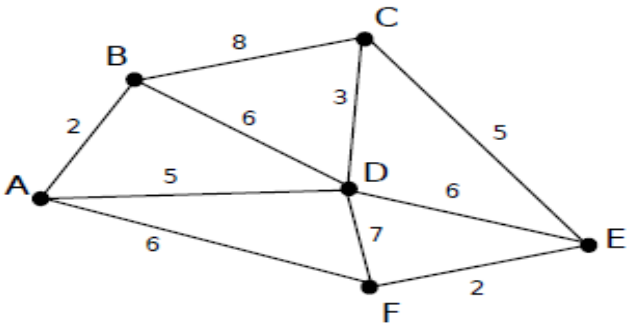
1. Write and explain the Prim's algorithm and find Minimum Spanning tree for the given graph



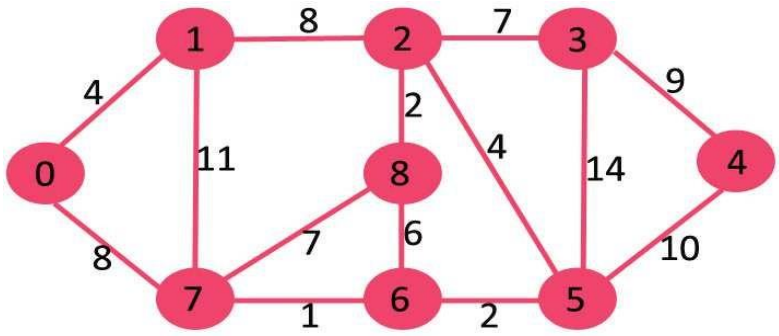
2. Apply Prim's algorithm to the following graph and find Minimum Spanning tree for the given graph



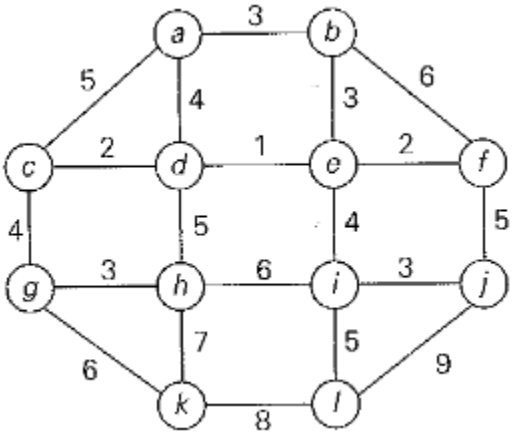
3. Apply Prim's algorithm to the following graph and find Minimum Spanning tree for the given graph



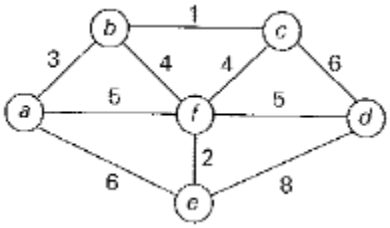
4. Apply Prim's algorithm to the following graph and find Minimum Spanning tree for the given graph



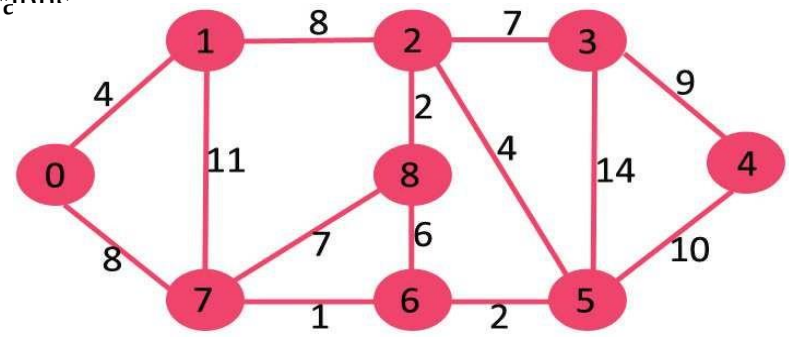
5. Apply Prim's algorithm to the following graph and find Minimum Spanning tree for the given graph



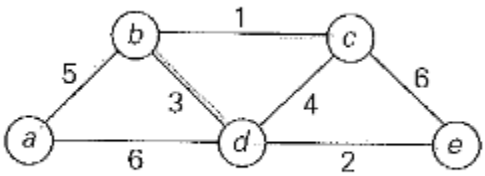
6. Write Kruska's algorithms and Apply Kruskal's algorithm to find a minimum spanning tree of the followinggraphs.



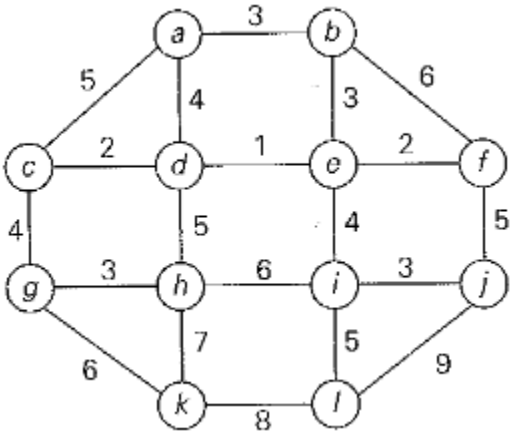
7. Apply Kruskal's algorithm to find a minimum spanning tree of the following graphs



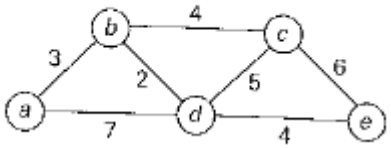
8. Apply Kruskal's algorithm to find a minimum spanning tree of the following graphs.



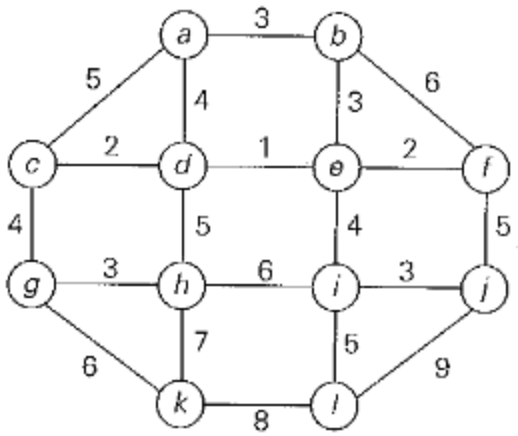
9. Apply Kruskal's algorithm to find a minimum spanning tree of the followinggraphs.



10. Write Dijkstra's Algorithm and solve the following instances of the single-source shortest-paths problem with vertex“a” as the source.



11. Using Dijkstra's Algorithm to solve the following instances of the single-source shortest-paths problem withvertex “a” as the source:



12. Write and explain the Huffman algorithm and construct Huffman coding tree.
Consider the five character alphabet [A, B, C, D, _] with the following occurrence probabilities.

character	A	B	C	D	_
probability	0.35	0.1	0.2	0.2	0.15

13. Construct a Huffman code for following data.

character	A	B	C	D	E
probability	0.1	0.1	0.2	0.2	0.4

14.

a. Construct a Huffman code for the following data:

character	A	B	C	D	_
probability	0.4	0.1	0.2	0.15	0.15

b. Encode the text ABACABAD using the code of question (a).

c. Decode the text whose encoding is 100010111001010 in the code of question (a).

15. Write a note on following
    a. Trivial lower Bounds
    b. Information-Theoretic Arguments
    c. Adversary Arguments
    d. Problem Reduction
16. Explain Decision Tree and draw the Decision tree for minimum of three numbers,
17. Draw the Decision tree for binary search in a four-element array.
18. Draw the Decision tree for the three-element selection sort.
19. Draw the Decision tree for the three-element insertion sort
20. Explain P, NP, and NP-complete Problems.
21. Write a note on Challenges of Numerical Algorithm

Software Engineering

UNIT - I

2 marks questions

1) Define Software Engineering.
2) What is software?
3) Mention any two differences between software Engineering and System Engineering.
4) Define software Process.
5) What is Software Process Model?
6) What is CASE?
7) Give any two attributes of good software.
8) What is Waterfall Model?
9) What is Evolutionary Development?
10) Define component based Software Engineering.
11) Give any two advantages of Incremental Development Process.
12) Define Software specification.
13) What is Component (or unit) testing?
14) What is System testing?
15) What is Acceptance testing?
16) What is requirement engineering?
17) What are Functional and non-functional requirement?
18) What is SRS?
19) What is structured language specification?

Long answer questions:

1) What is software? Explain two types of software products. (4)
2) What is Software Process? Explain Fundamental activities in Software Process. (4)
3) Explain attributes of good software. (4)
4) Explain Key challenges facing software engineering. (4)
5) Write a note on Professional and ethical responsibilities. (4)
6) Explain waterfall Model with a neat diagram. (6)
7) With a diagram, explain evolutionary Development. (4/6)
8) Explain Component based Software Engineering with diagram. (6)

9) Explain Incremental delivery with a diagram. (4/6)
10) Explain Spiral model with diagram. (6)
11) Explain four phases of requirement Engineering Process. (6)
12) With diagram, explain the specific design process activities of software design. (6)
13) Write a note on Rational Unified Process. (4)
14) Explain Functional and Non-functional requirement. (4/6)
15) Explain structure of Requirement document. (6)
16) Write a note on agile methods. (4/6)
17) With diagram explain Plan-driven and agile Specification. (6)

UNIT II

2 Mark questions:

1) Define the term requirement elicitation and analysis
2) Define the term stakeholder. Mention the different categories of stakeholders.
3) What is meant by Requirement Discovery and Requirement documentation?
4) What is Requirement classification and Requirement prioritisation?
5) Differentiate Validity checks and Consistency checks.
6) Write the difference between completeness checks and realism checks.
7) Define verifiability in requirement validation.
8) What is test-case generation in the requirement validation process?
9) Differentiate formal requirement review and informal requirement review.
10) Define the terms Requirement identification and Traceability policy.
11) What are Mutable Requirements? Give two examples
12) What are Emergent requirements and Compatibility Requirements.
13) What is Behavioural model? Mention the types.
14) What is Data-flow model? List the notations used in Data-flow model.
15) Which notations are used for state machine modelling? Give its usage.
16) What is ERA modelling? Why it is used?
17) What is data dictionary? Mention the advantages of using data dictionary.
18) What is object model? List various object models.

Long answer questions:

1) Explain the reasons which causedifficulty in understanding stakeholder requirements. (6)

2) Explain the general process model of the elicitation and analysis process with thediagram. (6)
3) What is requirement validation? Explain the various validation process checks to becarried on the requirements document. (6)
4) List and explain requirement validation techniques. (4)
5) Briefly explain the concept of requirements review along with reviewer checks. (6)
6) Briefly explain requirements management. (4)
7) Explain the concept of requirements management planning. (4)
8) Explain the context of an ATM system with the diagram. (4)
9) Explain the data- flow diagram of order processing. (4)
10) Write a note on state-machine model. (4)
11) Write a note on data model. (4)
12) Write a note on object model. (4)
13) Write a note on inheritance model. (4)
14) Briefly explain object aggregation with the diagram. (4)
15) Explain object behaviour modelling with the help of a diagram. (4)
16) What is structured method? Explain the weaknesses of structured methods.
17) Briefly explain the components of a CASE tool for structured method support with a diagram. (6)

UNIT – III

2 Marks Questions

1) What is architectural design?
2) What are the major components of client-server model?
3) Expand APSE,
4) Give the layered model of a version management system.
5) Write the distinction between sub-systems and modules.
6) Name the two main strategies while decomposing a sub-system into modules.
7) Write any 2 advantages of function-oriented pipelining architecture.
8) Write the stages of object-oriented design process.
9) What is the use of static model and dynamic model w.r.t. system context?
10) What is object identification?
11) What is grammatical analysis of a natural language?

12) What is behavioural approach?
13) What is scenario-based analysis?
14) What is the use of design models w.r.t.object oriented design?
15) Name the types of design models that describe an object oriented design.
16) What is the function of static model and dynamic model w.r.t.object oriented design?
17) What is the use of subsystem model and sequence models?
18) Name the four elements of design patterns.

Long answer questions:

1) What are the various points that are considered while developing architectural model? (4)
2) Write the advantages and disadvantages of a shared repository model. (4/6)
3) Explain client-server model with an example diagram. (4/6)
4) Explain layered model with a diagram. (4/6)
5) Write a note on object-oriented decomposition. (4)
6) Explain function-oriented pipelining with an example. (4)
7) Write a note on object oriented design process with an example. (4/6)
8) Explain system context and models of use with a use-case diagram. (4/6)
9) Briefly explain architectural design with an example. (4)
10) Explain the various proposals mode to identify object classes. (4/6)
11) Explain sequence model that shows the operations involved in collecting the data from a weather section with a diagram. (4/6)
12) With a statechart diagram, explain how WeatherStation object responds to requests for various services? (4/6)
13) Write a note on object interface specification. (4/6)
14) Write a note on design patterns. (4/6)

UNIT-IV

2 Marks Questions

1) What is test planning?
2) What is system testing?
3) What are two phases in system testing?

4) What is Integration testing?
5) What is top-down integration and down-up integration?
6) What is release testing?
7) What is black Box Testing and white box testing?
8) What is glass Box or clear Box testing?
9) What is Component Testing?
10) What is software testing workbench?
11) Describe Junit.
12) What is Interface testing?
13) What is Unit testing and regression testing?
14) What is alpha testing and beta testing?
15) What is Smoke testing?
16) What is test case design?

Long answer questions:

1) Explain V model (planning Verification and Validation) with diagram. (6)
2) Explain the structure of software test plan. (6)
3) What is system Testing? Explain two distinct phases of System Testing. (6)
4) Explain the top-down and bottom-up integration testing? 4 marks
5) What are the different components that are tested in unit testing?
6) What are the different types of interface errors in interface testing?
7) What are interface errors? Mention different classes of Interface errors. (4)
8) Write the guidelines of interface testing? (6)
9) What is test case design? Explain the various approaches involved in test case design. (6)
10) Explain Equivalence Partitions with a diagram? (4)
11) Explain structural testing? (4)
12) Explain path testing? (4)
13) Explain Test automation with diagram. (6)
14) Explain activities involved in smoke testing. (4)
15) Explain steps involved in bottom-up integration testing. (4)
16) Explain Unit test procedures with diagram. (4/6)

--*-*-*-*-*-*-*

Statistical Computing and R Programming

Unit-I

2-mark questions

1. What are the two ways of assignment operators in R? Give an example.
2. What is vector? Give an example to create a vector?
3. How do you find length of a vector? Give an example.
4. How do you sort a vector in descending order? Give an example
5. Create and store a sequence of values from 5 to −11 that progresses in steps of 0.3
6. Let vector, myvect with elements 5, -3,4,4,4,8,10,40221, -8,1. Write code to delete last element from it.
7. Write the purpose of negative indexing in vectors? Give an example.
8. If baz <- c(1,-1,0.5,-0.5) and qux <- 3, find the value of baz+quax.
9. What is the use of cbind and rbind functions in Matrix? Give an example
10. How do you find the dimension of the matrix? Give an example
11. Construct a 4 × 2 matrix that is filled row-wise with the values 4.3, 3.1, 8.2, 8.2, 3.2, 0.9, 1.6, and 6.5, in that order using R command.
12. What is the use of diag command in R? Give an example.
13. Write proper code to replace the third column of matrix B with the values in the third row of B.
14. Write an example to find transpose and inverse of a matrix using R command?
15. What is the difference between & and && in R? Give an example.
16. Write R command to store the vector c(8,8,4,4,5,1,5,6,6,8) as bar. Identify the elements less than or equal to 6 AND not equal to 4.
17. How do you count the number of individual characters in a string? Give an example.
18. What is levels function in R? Give an example
19. What is list in R? Give an example.
20. What is list slicing in lists? Give an example.
21. How do you name list contents? Give an example.
22. What is the purpose of attributes and class functions? Give an example.
23. What is the difference between ggplot2 and base R graphics create plots? Give an example.

4 or 6 marks questions

1. Explain seq, rep and length functions on vectors with example.
2. Repeat the vector c (-1,3, -5,7, -9) twice, with each element repeated 10 times, and store the result. Display the result sorted from largest to smallest.
3. How do you extract elements from vectors? Explain it using individual and vector of indexes with example?
4. How do you create matrix in R? Explain with Its necessary attributes? Give an example.
5. Do the following operations on a square matrix
    a. Retrieve third and first rows of A, in that order, and from those rows, second and third column elements.
    b. Retrieve diagonal elements
    c. Delete second column of the matrix.
6. Explain row, column, and diagonal extractions of matrix elements with example.
7. How do you omit and overwrite an element/s from a matrix? Explain with example.
8. Explain any 3 matrix operations using R commands with example. (6)
9. How do you create arrays in R? Explain with suitable example
10. Explain any 3 relational and logical operators used in R, with an example.
11. Explain any, all and which functions with example, on logical vector.
12. Explain cat and paste functions with necessary arguments in R. Give an example.
13. Write a note on escape sequences with example.
14. Explain substr, sub and gsub functions on strings with an example.
15. What is factor? How do you define and order levels in a factor?
16. Explain cut function on factors with an example.
17. What do you mean by member reference in lists? Explain with an example. (4)

18. What is data frame? Create a data frame as shown in the given table and write R commands a) To extract the third, fourth, and fifth elements of the third column b) To extract the elements of age column using dollar operator.

person	age	sex
Peter	42	M
Lois	40	F
Meg	17	F
Chris	14	M
Stewie	1	M

19. How do you add data columns and combine data frames? Explain with example.
20. Write a note on special values used in R with an example for each.
21. Explain Is-Dot Object-Checking Functions and As-Dot Coercion Functions with an example.
22. List and explain graphical parameters used in plot function in R with example (any 4)
23. How do you add Points, Lines, and Text to an Existing Plot? Explain with example.
24. How do you set appearance constants and aesthetic mapping with geoms? Explain with example.

Unit-II

2-mark questions

1. What are Table format Files? List its features.
2. How can you read a CSV file in R? Give Example
3. What is the purpose of write.table command? Give an example.
4. How to read Web based files? Give example
5. How to save plots and graphics directly to file? Give example
6. Differentiate dput() and dget() functions in R
7. Differentiate global and local environment in R
8. What the "search path" in R refers to.? How can you view the current search path in R?
9. What is purpose of switch () function in R? Give example
10. What is use of apply function in R? Give example

11. Differentiate break and next statements in R
12. What is repeat statement in R? Give an example.
13. What do you mean by lazy evaluation? Give an example.
14. How to check for Missing Arguments of function in R? Give example
15. Write an R code snippet that demonstrates the use of a tryCatch block to handle an exception.
16. How can you measure the execution time of a specific piece of code in R?
17. Give an example of timing a code block using the system.time function.
18. How do you unmount packages in R? Give an example.
19. How the :: operator help to prevent masking when calling functions from specific packages?
20. Why is data visualization important in data analysis with R?
21. Differentiate boxplot and scatter plot

4 or 6 marks questions

1. How do you read external data files into R? Explain any three types of files with necessary commands to read their characters into R, with example.
2. What do you mean by argument matching to function in R programming? Explain any three of them.
3. Explain **if …. else** and **ifelse** statements with syntax and example.
4. What do you mean by nesting and stacking in R? Explain with an example.
5. Explain for loop with its varieties in R with syntax and example.
6. Explain while loop in R with syntax and example.
7. What is apply function? Explain variety of apply functions with an example.
8. How do you define and call, user defined functions in R? Explain with an example.
9. How do you set default arguments to a user defined function? Explain with an example.
10. Explain three kinds of specialized user defined functions in R, with example.
11. What is exception handling? How do you catch errors with try Statements? Explain with example.
12. What is “masking" in R? Explain two most common masking situations in R, with example.
13. How do you draw barplot and pie chart in R? Explain with example.
14. Explain histograms in R with an example.

15. Explain boxplot in R with an example.
16. What is scatterplot? Explain single plot and matrix of plots, with an example.

UNIT-III

2 Marks Questions

1. What is a Statistics? Mention it types.
2. Compare Descriptive Statistics and *Inferential statistics.*
3. What are the four Types of Data & Measurement Scales?
4. What are nominal data and ordinal data? Give an example.
5. What are interval data and ratio data? Give an example.
6. Define Measure of Central Tendency. List its types.
7. Define Mode. Determine the mode for the following numbers.

   2 4 8 4 6 2 7 8 4 3 8 9 4 3 5
8. Define Median.Write the steps to calculate Median.
9. Define Median. Determine the median for the numbers

   2 4 8 4 6 2 7 8 4 3 8 9 4 3 5
10. Determine the mode and median for the following numbers.

    213 345 609 073 167 243 444 524 199 682
11. Compute the mean for the following numbers.

    17.3 44.5 31.6 40.0 52.8 38.8 30.1 78.5
12. Define Percentiles. Write the steps to calculate location of Percentiles.
13. What is Quartiles? Determine Q3 for 14, 12, 19, 23, 5, 13, 28, 17.
14. Determine the 30th percentile of the following eight numbers: 14, 12, 19, 23, 5, 13, 28, 17.
15. Define Range. Write the range of following numbers.

    16 28 29 13 17 20 11 34 32 27 25 30 19 18 33
16. Define Interquartile Range. Write its formulae.
17. Define Mean Absolute Deviation. Write itsformulae.
18. Define Variance. Write its formulae.
19. Define Standard Deviation. Write itsformulae.
20. Write the formulae for sample Variance and sample Standard Deviation.
21. Define Z score. Write itsformulae.

22. State Empirical Rule.List the condition.
23. Define Coefficient of Variation. Write itsformuale
24. Define Measures of Shape.Mention its types.
25. What is Skewness? Draw its types.
26. Write the formulae to calculate Coefficient of Skewness using Karl Pearson.
27. Write the formulae to calculate Coefficient of Skewness using Bowel's.
28. Write the relationship between mean, median and mode in various skewness.
29. What is Kurtosis? Mention its types.
30. What are the components of Box-and-Whisker Plots?
31. What are Histogram, Pie charts, frequency polygons and Bar charts?
32. What are Stem and Leaf plot?
33. What is a Probability? Mention it types.
34. What is an Experiment and Event? Give Example.
35. What is the classical method of assigning of a Probability? Give Example.
36. What is the relative frequency of occurrence method assigning of a Probability? Give Example.
37. What are the subjective probabilities? Give Example.
38. Define Elementary Events. Give an example.
39. Define Sample Space. Give an example.
40. Give an example for Unions and Intersections.
41. Define Mutually Exclusive Events and Independent Events. Give an example.
42. Define Collectively Exhaustive Events. Give an example.
43. Define Complementary Events. Give an example.
44. If a population consists of the positive even numbers through 30 and if A = {2, 6, 12, 24}, what is A' ?
45. What are the three types of Counting the Possibilities
46. Write the general Addition and Special Addition Laws.
47. Write the General Law of Multiplication and Special Law of Multiplication
48. Write the Conditional Probability
49. What are discrete random variables? Give an example.
50. What are Continuous random variables? Give an example.
51. Write the formulae for Mean, Variance, and Standard Deviation of Discrete Distributions.
52. List the assumptions of Binomial Distribution.
53. Write the formulae of binomial distribution.
54. A company places a seven-digit serial number on each part that is made. Each digit of the serial number can be any number from 0 through 9. Digits can be repeated in the serial number. How many different serial numbers are possible?

55. A small company has 20 employees. Six of these employees will be selected randomly to be interviewed as part of an employee satisfaction program. How many different groups of six can be selected?

56. What are Poisson distribution? Give an example.
57. List the characteristics ofPoisson distribution.
58. Write the formulae of Poisson distribution.
59. What are uniform distributions? Write the probability density function of uniform distribution.
60. Write the formulae of mean and standard deviation of a uniform distribution.
61. Write the formulae of Probabilities in a Uniform Distribution.
62. List the characteristics ofnormal distribution.
63. Write the probability density function Normal Distribution
64. What are t Distribution? Write the formula for the t statistic.
65. Write the Confidence Intervals formulae in t statistic.
66. Write the Z formulae for sample mean.

Long Answer Questions **(THREE, FOUR OR FIVE AND SIX Marks Questions)**

1. Explain four Types of Data & Measurement Scales with example.
2. Explain Kurtosis types with diagram.
3. Explain Measure of Skewness with its types.
4. The number of U.S. cars in service by top car rental companies in a recent year according to Auto Rental News follows. Compute the mode, the median, and the mean.

Company	Number of Cars in Service
Enterprise	643,000
Hertz	327,000
National/Alamo	233,000
Avis	204,000
Dollar/Thrifty	167,000
Budget	144,000
Advantage	20,000
U-Save	12,000
Payless	10,000
ACE	9,000
Fox	9,000
Rent-A-Wreck	7,000
Triangle	6,000

5. Compute the 35th percentile, the 55th percentile,Q1, Q2, and Q3 for the following data

16 28 29 13 17 20 11 34 32 27 25 30 19 18 33

6. The following shows the top 16 global marketing categories for advertising spending for a recent year according to Advertising Age. Spending is given in millions of U.S. dollars. Determine the first, the second, and the third quartiles for these data.

Category	Ad Spending
Automotive	$22,195
Personal Care	19,526
Entertainment & Media	9,538
Food	7,793
Drugs	7,707
Electronics	4,023
Soft Drinks	3,916
Retail	3,576
Cleaners	3,571
Restaurants	3,553
Computers	3,247
Telephone	2,488
Financial	2,433
Beer, Wine & Liquor	2,050
Candy	1,137
Toys	699

7.

3.11 A data set contains the following seven values.

6 2 4 9 1 3 5

a. Find the range.
b. Find the mean absolute deviation.
c. Find the population variance.
d. Find the population standard deviation.
e. Find the interquartile range.
f. Find the *z* score for each value.
g. Calcualte Coefficient of Variation.

8.

3.12 A data set contains the following eight values.

4 3 0 5 2 9 4 5

a. Find the range.
b. Find the mean absolute deviation.
c. Find the sample variance.
d. Find the sample standard deviation.
e. Find the interquartile range.

CalculateCoefficient of Variation

9. Shown here is a sample of six of the largest accounting firms in the United States and the number of partners associated with each firm as reported by the Public Accounting Report. Calculate sample variance and sample standard deviation.

Firm	Number of Partners
Deloitte & Touche	2654
Ernst & Young	2108
PricewaterhouseCoopers	2069
KPMG	1664
RSM McGladrey	720
Grant Thornton	309

10.

3.15 Use your calculator or computer to find the population variance and population standard deviation for the following data.

123	090	546	378
392	280	179	601
572	953	749	075
303	468	531	646

11.

3.35 On a certain day the average closing price of a group of stocks on the New York Stock Exchange is $35 (to the nearest dollar). If the median value is $33 and the mode is $21, is the distribution of these stock prices skewed? If so, how?

12.

3.36 A local hotel offers ballroom dancing on Friday nights. A researcher observes the customers and estimates their ages. Discuss the skewness of the distribution of ages if the mean age is 51, the median age is 54, and the modal age is 59.

13.

14. **3.38** Suppose the following data are the ages of Internet users obtained from a sample. Use these data to compute a Pearsonian coefficient of skewness. What is the meaning of the coefficient?

41	15	31	25	24
23	21	22	22	18
30	20	19	19	16
23	27	38	34	24
19	20	29	17	23

15. **3.39** Construct a box-and-whisker plot on the following data. Do the data contain any outliers? Is the distribution of data skewed?

540	690	503	558	490	609
379	601	559	495	562	580
510	623	477	574	588	497
527	570	495	590	602	541

Shown here is a list of the top five industrial and farm equipment companies in the United States, along with their annual sales ($ millions). Construct a pie chart and a bar graph to represent these data, and label the slices with the appropriate percentages.

Firm	Revenue ($ million)
Caterpillar	30,251
Deere	19,986
Illinois Tool Works	11,731
Eaton	9,817
American Standard	9,509

16. The following list shows the top six pharmaceutical companies in the United States and their sales figures ($ millions) for a recent year. Use this information to construct a pie chart and a bar graph to represent these six companies and their sales.

Pharmaceutical Company	Sales
Pfizer	52,921
Johnson & Johnson	47,348
Merck	22,939
Bristol-Myers Squibb	21,886
Abbott Laboratories	20,473
Wyeth	17,358

17.

The following data represent the costs (in dollars) of a sample of 30 postal mailings by a company.

3.67	2.75	9.15	5.11	3.32	2.09
1.83	10.94	1.93	3.89	7.20	2.78
6.72	7.80	5.47	4.15	3.55	3.53
3.34	4.95	5.42	8.64	4.84	4.10
5.10	6.45	4.65	1.97	2.84	3.21

Using dollars as a stem and cents as a leaf, construct a stem-and-leaf plot of the data.

18.

2.7 Construct a histogram and a frequency polygon for the following data.

Class Interval	Frequency
10–under 20	9
20–under 30	7
30–under 40	10
40–under 50	6
50–under 60	13
60–under 70	18
70–under 80	15

19.

2.6 Construct a histogram and a frequency polygon for the following data.

Class Interval	Frequency
30–under 32	5
32–under 34	7
34–under 36	15
36–under 38	21
38–under 40	34
40–under 42	24
42–under 44	17
44–under 46	8

20.

2.9 Construct a stem-and-leaf plot using two digits for the stem.

212	239	240	218	222	249	265	224
257	271	266	234	239	219	255	260
243	261	249	230	246	263	235	229
218	238	254	249	250	263	229	221
253	227	270	257	261	238	240	239
273	220	226	239	258	259	230	262
255	226						

21. Explain general Methods of assigning probabilities with example.

22. A supplier shipped a lot of six parts to a company. The lot contained three defective parts. Suppose the customer decided to randomly select two parts and test them for defects. How large a sample space is the customer potentially working with? List the sample space. Using the sample space list, determine the probability that the customer will select a sample with exactly one defect.

23.

4.2 Given $X = \{1, 3, 5, 7, 8, 9\}$, $Y = \{2, 4, 7, 9\}$, and $Z = \{1, 2, 3, 4, 7\}$, solve the following.

a. $X \cup Z =$ _____ **b.** $X \cap Y =$ _____

c. $X \cap Z =$ _____ **d.** $X \cup Y \cup Z =$ _____

e. $X \cap Y \cap Z =$ _____ **f.** $(X \cup Y) \cap Z =$ _____

g. $(Y \cap Z) \cup (X \cap Y) =$ _____ **h.** X or Y = _____

i. Y and X = _____

24. A company's customer service 800 telephone system is set up so that the caller has six options. Each of these six options leads to a menu with four options. For each of these four options, three more options are available. For each of these three options, another three options are presented. If a person calls the 800 number for assistance, how many total options are possible?

25. A bin contains six parts. Two of the parts are defective and four are acceptable. If three of the six parts are selected from the bin, how large is the sample space?

Which counting rule did you use, and why? For this sample space, what is the probability that exactly one of the three sampled parts is defective?

26. Explain Marginal, Union, Joint and Conditional Probabilities with example.

27. The client company data from the Decision Dilemma reveal that 155 employees worked one of four types of positions. Shown here again is the raw values matrix (also called a contingency table) with the frequency counts for each category and for subtotals and totals containing a breakdown of these employees by type of position and by sex. If an employee of the company is selected randomly, what is the probability that the employee is female or a professional worker?

COMPANY HUMAN RESOURCE DATA

		Sex		
		Male	Female	
Type of Position	Managerial	8	3	11
	Professional	31	13	44
	Technical	52	17	69
	Clerical	9	22	31
		100	55	155

28.

4.8 Given $P(A) = .10$, $P(B) = .12$, $P(C) = .21$, $P(A \cap C) = .05$, and $P(B \cap C) = .03$, solve the following.

a. $P(A \cup C) =$ _____

b. $P(B \cup C) =$ _____

c. If A and B are mutually exclusive, $P(A \cup B) =$ _____

29.

4.12 According to the U.S. Bureau of Labor Statistics, 75% of the women 25 through 49 years of age participate in the labor force. Suppose 78% of the women in that age group are married. Suppose also that 61% of all women 25 through 49 years of age are married and are participating in the labor force.

a. What is the probability that a randomly selected woman in that age group is married or is participating in the labor force?

b. What is the probability that a randomly selected woman in that age group is married or is participating in the labor force but not both?

c. What is the probability that a randomly selected woman in that age group is neither married nor participating in the labor force?

30. A company has 140 employees, of which 30 are supervisors. Eighty of the employees are married, and 20% of the married employees are supervisors. If a

company employee is randomly selected, what is the probability that the employee is married and is a supervisor?

31.

4.15 Use the values in the contingency table to solve the equations given.

	C	D	E	F
A	5	11	16	8
B	2	3	5	7

a. $P(A \cap E) =$ _____
b. $P(D \cap B) =$ _____
c. $P(D \cap E) =$ _____
d. $P(A \cap B) =$ _____

32.

4.19 A study by Peter D. Hart Research Associates for the Nasdaq Stock Market revealed that 43% of all American adults are stockholders. In addition, the study determined that 75% of all American adult stockholders have some college education. Suppose 37% of all American adults have some college education. An American adult is randomly selected.

a. What is the probability that the adult does not own stock?
b. What is the probability that the adult owns stock and has some college education?
c. What is the probability that the adult owns stock or has some college education?
d. What is the probability that the adult has neither some college education nor owns stock?
e. What is the probability that the adult does not own stock or has no college education?
f. What is the probability that the adult has some college education and owns no stock?

33.

5.1 Determine the mean, the variance, and the standard deviation of the following discrete distribution.

x	$P(x)$
1	.238
2	.290
3	.177
4	.158
5	.137

34. Determine the mean, the variance and the standard deviation of the following discrete distribution.

TABLE 5.2
Discrete Distribution of Occurrence of Daily Crises

Number of Crises	Probability
0	.37
1	.31
2	.18
3	.09
4	.04
5	.01

35. A Gallup survey found that 65% of all financial consumers were very satisfied with their primary financial institution. Suppose that 25 financial consumers are sampled and if the Gallup survey result still holds true today, what is the probability that exactly 19 are very satisfied with their primary financial institution?(Using Binomial Distribution formulae)

36. According to the U.S. Census Bureau, approximately 6% of all workers in Jackson, Mississippi, are unemployed. In conducting a random telephone survey in Jackson, what is the probability of getting two or fewer unemployed workers in a sample of 20? (Using Binomial Distribution formulae)

37. Suppose bank customers arrive randomly on weekday afternoons at an average of 3.2 customers every 4 minutes. What is the probability of exactly 5 customers arriving in a 4-minute interval on a weekday afternoon? The lambda for this problem is 3.2 customers per 4 minutes. The value of x is 5 customers per 4 minutes. (Using Poisson Formula)

38. Bank customers arrive randomly on weekday afternoons at an average of 3.2 customers every 4 minutes. What is the probability of having more than 7 customers in a 4-minute interval on a weekday afternoon? (Using Poisson Formula)

39. A bank has an average random arrival rate of 3.2 customers every 4 minutes. What is the probability of getting exactly 10 customers during an 8-minute interval? (Using Poisson Formula)

40.

5.15 Find the following values by using the Poisson formula.

a. $P(x = 5|\lambda = 2.3)$
b. $P(x = 2|\lambda = 3.9)$
c. $P(x \leq 3|\lambda = 4.1)$
d. $P(x = 0|\lambda = 2.7)$
e. $P(x = 1|\lambda = 5.4)$
f. $P(4 < x < 8|\lambda = 4.4)$

41. Suppose the amount of time it takes to assemble a plastic module ranges from 27 to 39 seconds and that assembly times are uniformly distributed. Describe the distribution. What is the probability that a given assembly will take between 30 and 35 seconds? Fewer than 30 seconds?
42. According to the National Association of Insurance Commissioners, the average annual cost for automobile insurance in the United States in a recent year was $691. Suppose automobile insurance costs are uniformly distributed in the United States with a range of from $200 to $1,182. What is the standard deviation of this uniform distribution? What is the height of the distribution? What is the probability that a person's annual cost for automobile insurance in the United States is between $410 and $825?

43.

a. What is the probability of obtaining a score greater than 700 on a GMAT test that has a mean of 494 and a standard deviation of 100? Assume GMAT scores are normally distributed.

$$P(x > 700 \mid \mu = 494 \text{ and } \sigma = 100) = ?$$

44. GMAT test that has a mean of 494 and a standard deviation of 100? Assume GMAT scores are normally distributed. What is the probability of randomly obtaining a score between 300 and 600 on the GMAT exam?

$$P(300 < x < 600 \mid \mu = 494 \text{ and } \sigma = 100) = ?$$

45. GMAT test that has a mean of 494 and a standard deviation of 100? Assume GMAT scores are normally distributed. what is the probability of randomly drawing a score that is 550 or less?

a. $$P(x \leq 550 \mid \mu = 494 \text{ and } \sigma = 100) = ?$$

46. GMAT test that has a mean of 494 and a standard deviation of 100? Assume GMAT scores are normally distributed. What is the probability of getting a score between 350 and 450 on the same GMAT exam?

$$P(350 < x < 450 \mid \mu = 494 \text{ and } \sigma = 100) = ?$$

47. Suppose the following data are selected randomly from a population of normally distributed values. Construct a confidence interval to estimate the population mean.And 90% confidence level. (Using the t Statistic). The sample mean is 13.56 and the sample standard deviation is 7.8.

6	21	17	20	7	0	8	16	29
3	8	12	11	9	21	25	15	16

48. Assuming x is normally distributed; use the following information to compute a 99% confidence interval to estimatethe population mean.And 99% confidence level. (Using the t Statistic) The sample mean is 2.14 and the sample standard deviation is 1.29.

3 1 3 2 5 1 2 1 4 2 1 3 1 1

UNIT-IV

1. What is Hypothesis? Give an Example.
2. What are the Types of Hypotheses?
3. What are Type-I Error? Give an example.
4. What are null and alternate hypotheses? Give Example
5. What are Type-II Error? Give an example.
6. Show therelationship between α, β, and power.
7. What are One Sample t Test? List its uses.
8. Write the t test statistics formulae for One Sample t Test.
9. State the hypotheses One Sample t Test?
10. What are Paired Samples t Test? List its uses.
11. Write the t test statistics formulae for Paired Samples t Test
12. State the hypotheses Paired Samples t Test?
13. What are Independent Samples t Test? List its uses.
14. State the hypotheses Independent Samples t Test.
15. What are Chi-Square Test of Independence? List its uses.
16. Write the t test statistics formulae for Chi-Square Test of Independence.
17. What are ONE WAY ANOVA? List its uses.
18. Write the formulae of MSC,MSE and F statistics for ONE WAY ANOVA
19. Write the formulae of SSC, SSE and SST for ONE WAY ANOVA.
20. Write the Z formulae for One Sample Proportion Test.
21. Write the Z formulae for Two Sample Proportion Test.
22. Define Correlation Analysis and Regression Analysis.
23. What are the uses of Uses of correlations?

24. List the Types of Correlation.
25. What are Positive Correlation? Give an example.
26. What are Negative Correlation? Give an example.
27. What are Simple Correlation? Give an example.
28. What are Partial Correlation? Give an example.
29. What are Multiple Correlation? Give an example.
30. What are Zero Correlation? Give an example.
31. What are Linear Correlation? Give an example.
32. What are Non-linear Correlation? Give an example.
33. What do you mean by Perfect Positive Correlation? Write its condition and draw the scatter diagram.
34. What do you mean by Perfect Negative Correlation? Write its condition and draw the scatter diagram.
35. What do you mean by High Degree of Positive Correlation? Write its condition and draw the scatter diagram.
36. What do you mean by High Degree of Negative? Write its condition and draw the scatter diagram.
37. What do you mean by Low Degree of Positive Correlation? Write its condition and draw the scatter diagram.
38. What do you mean by Low Degree of Negative Correlation? Write its condition and draw the scatter diagram.
39. What do you mean by Zero (No) Correlation? Write its condition and draw the scatter diagram.
40. Write the formula to calculate Karl Pearson's coefficient of correlation method using direct method.
41. Write the formula to calculate Karl Pearson's product moment coefficient of correlation.
42. What is a Correlation matrix? Give a example.
43. What are the uses of Uses of Regression Analysis?
44. Write the formulae for regression equation of X on Y and Y on X.

Long Answer Questions **(THREE, FOUR OR FIVE AND SIX Marks Questions)**

1. Explain three Types of Hypotheses with example.
2. Explain Type I and Type II Errors with example.

3. Imagine a company wants to test the claim that their batteries last more than 40 hours. Using a simple random sample of 15 batteries yielded a mean of 44.9 hours, with a standard deviation of 8.9 hours. Test this claim using a significance level of 0.05.
4. A random of sample size 20 is taken resulting in sample mean of 25.51 and a sample standard deviation of 2.1933.Assume data is normally distributed use this information and α =0.05 to test the following hypothesis.

$$H_0: \mu = 25 \text{ pounds}$$
$$H_a: \mu \neq 25 \text{ pounds}$$

5. A random sample of size 20 is taken, resulting in a sample mean of 16.45 and a sample standard deviation of 3.59. Assume x is normally distributed and use this information and $\alpha = .05$ to test the following hypotheses.

$$H_0: \mu = 16 \qquad H_a: \mu \neq 16$$

6. To test the difference in the two methods, the managers randomly select one group of 15 newly hired employees to take the three-day seminar (method A) and a second group of 12 new employees for the two-day DVD method (method B). Table shows required data Using α= .05, the managers want to determine whether there is a significant difference in the mean scores of the two groups.

Method A	Method B
$\bar{x}_1 = 47.73$	$\bar{x}_2 = 56.5$
$s_1^2 = 19.495$	$s_2^2 = 18.273$
$n_1 = 15$	$n_2 = 12$

7. Use the data given and the eight step process to test the following hypotheses. Use 1% level of significance.

$$H_0: \mu_1 - \mu_2 = 0 \qquad H_a: \mu_1 - \mu_2 < 0$$

Sample 1	Sample 2
$n_1 = 8$	$n_2 = 11$
$\bar{x}_1 = 24.56$	$\bar{x}_2 = 26.42$
$s_1^2 = 12.4$	$s_2^2 = 15.8$

8. To test this, we may recruit a simple random sample of 20 college basketball players and measure each of their max vertical jumps. Then, we may have each player use the training program for one month and then measure their max vertical jump again at

the end of the month.To determine whether the training program increase max vertical jump, we will perform a paired samples t-test at significance level α = 0.05.sample mean of the differences is -0.95 and sample standard deviation of the differences is 1.317

9. Suppose a stock market investor is interested in determining whether there is a significant difference in the P/E (price to earnings) ratio for companies from one year to the next.Assume α=.01 Assume that differences in P/E ratios are normally distributed in the population. n=9

Company	Year 1 P/E Ratio	Year 2 P/E Ratio
1	8.9	12.7
2	38.1	45.4
3	43.0	10.0
4	34.0	27.2
5	34.5	22.8
6	15.2	24.1
7	20.3	32.3
8	19.9	40.1
9	61.9	106.5

10. Use the data given and a 1% level of significance to test the following hypotheses. Assume the differences are normally distributed in the population.

$H_0: D = 0 \qquad H_a: D > 0$

Pair	Sample 1	Sample 2
1	38	22
2	27	28
3	30	21
4	41	38
5	36	38

11. Use the data given to test the following hypotheses Assume the differences are normally distributed in the population.

$H_0: D = 0 \qquad H_a: D \neq 0$

Individual	Before	After
1	107	102
2	99	98
3	110	100
4	113	108
5	96	89

12. Suppose a store manager wants to find out whether the results of this consumer survey apply to customers of supermarkets in her city. To do so, she interviews 207 randomly selected consumers as they leave supermarkets in various parts of the city.

Now the manager can use a chisquare test to determine whether the observed frequencies of responses from this survey are the same as the frequencies that would be expected on the basis of the national survey. (α= .05).

Results of a Local Survey of Consumer Satisfaction

Response	Frequency (f_o)
Excellent	21
Pretty good	109
Only fair	62
Poor	15

Expected %

Excellent	8%
Pretty good	47%
Only fair	34%
Poor	11%

13. Use chi-square test to determine whether the observed frequencies are distributed the same as the expected frequencies. (α= .05).

Category	f_o	f_e
1	53	68
2	37	42
3	32	33
4	28	22
5	18	10
6	15	8

14. Use chi-square test to determine whether the observed frequencies represent a uniform distribution. (α= .01).

Category	f_o
1	19
2	17
3	14
4	18
5	19
6	21
7	18
8	18

15. Dairies would like to know whether the sales of milk are distributed uniformly over a year so they can plan for milk production and storage. A uniform distribution means that the frequencies are the same in all categories. In this situation, the producers are attempting to determine whether the amounts of milk sold are the same for each month of the year. They ascertain the number of gallons of milk sold by sampling one large supermarket each month during a year, obtaining the following data. Use α=.01 to test whether the data fit a uniform distribution.(Using Chi-square Test)

Month	Gallons	Month	Gallons
January	1610	August	1350
February	1585	September	1495
March	1649	October	1564
April	1590	November	1602
May	1540	December	1655
June	1397	Total	18,447
July	1410		

16. Construct one way ANOVA table for following data.

1	2	3
2	5	3
1	3	4
3	6	5
3	4	5
2	5	3
1		5

17. A company has three manufacturing plants, and company officials want to determine whether there is a difference in the average age of workers at the three locations. The following data are the ages of five randomly selected workers at each plant. Perform a one-way ANOVA to determine whether there is a significant difference in the mean ages of the workers at the three plants. Use α = .01 and note that the sample sizes are equal.

Plant (Employee Ages)		
1	2	3
29	32	25
27	33	24
30	31	24
27	34	25
28	30	26

18. Construct one way ANOVA table for following data.

Machine Operator			
1	2	3	4
6.33	6.26	6.44	6.29
6.26	6.36	6.38	6.23
6.31	6.23	6.58	6.19
6.29	6.27	6.54	6.21
6.40	6.19	6.56	
	6.50	6.34	
	6.19	6.58	
	6.22		

19. A survey of the morning beverage market shows that the primary breakfast beverage for 17% of Americans is milk. A milk producer in Wisconsin, where milk is plentiful, believes the figure is higher for Wisconsin. To test this idea, she contacts a random sample of 550 Wisconsin residents and asks which primary beverage they consumed for breakfast that day. Suppose 115 replied that milk was the primary beverage. Using a level of significance of .05, test the idea that the milk figure is higher for Wisconsin.
20. A manufacturer believes exactly 8% of its products contain at least one minor flaw. Suppose a company researcher wants to test this belief. The null and alternative hypotheses are

$$H_0: p = .08$$
$$H_a: p \neq .08$$

The business researcher randomly selects a sample of 200 products, inspects each item for flaws, and determines that 33 items have at least one minor flaw. Calculating the sample proportion. (α=.10)

21. Using the given sample information, test following hypotheses. Note that x is the number in the sample having the characteristics of interest.

$H_0: p_1 - p_2 = 0 \quad H_a: p_1 - p_2 \neq 0$

Sample 1	Sample 2	
$n_1 = 368$	$n_2 = 405$	
$x_1 = 175$	$x_2 = 182$	Let $\alpha = .05$.

22. Using the given sample information, test following hypotheses. Note that x is the number in the sample having the characteristics of interest.

$H_0: p_1 - p_2 = 0$ $H_a: p_1 - p_2 > 0$

Sample 1	Sample 2	
$n_1 = 649$	$n_2 = 558$	
$\hat{p}_1 = .38$	$\hat{p}_2 = .25$	Let $\alpha = .10$.

23. Suppose you decide to test this result by taking a survey of your own and identify female entrepreneurs by gross sales. You interview 100 female entrepreneurs with gross sales of less than $100,000, and 24 of them define sales/profit as success. You then interview 95 female entrepreneurs with gross sales of $100,000 to $500,000, and 39 cite sales/profit as a definition of success. Use this information to test to determine whether there is a significant difference in the proportions of the two groups that define success as sales/profit. Use α=.01
24. A group of researchers attempted to determine whether there was a difference in the proportion of consumers and the proportion of CEOs who believe that fear of getting caught or losing one's job is a strong influence of ethical behavior. In their study, they found that 57% of consumers said that fear of getting caught or losing one's job was a strong influence on ethical behavior, but only 50% of CEOs felt the same way. Suppose these data were determined from a sample of 755 consumers and 616 CEOs. Does this result provide enough evidence to declare that a significantly higher proportion of consumers than of CEOs believe fear of getting caught or losing one's job is a strong influence on ethical behavior?(α=0.10).

25. Explain Types of Correlation with example.
26. Explain types of correlation with respect Correlation coefficient with condition and suitable scatter diagram.
27. From following information find the correlation coefficient between advertisement expenses and sales volume using Karl Pearson's coefficient of correlation method (Direct Method).

Firm	1	2	3	4	5	6	7	8	9	10
Advertisement Exp. (Rs. In Lakhs)	11	13	14	16	16	15	15	14	13	13
Sales Volume (Rs. In Lakhs)	50	50	55	60	65	65	65	60	60	50

28. Calculate the Karl Pearson's product moment of coefficient of correlation.

Day	Interest x	Futures Index y
1	7.43	221
2	7.48	222
3	8.00	226
4	7.75	225
5	7.60	224

29.Calculate the Karl Pearson's product moment of coefficient of correlation.

Student	1	2	3	4	5	6
Statistics(x)	7	4	6	9	3	8
Mathematics(y)	8	5	4	8	3	6

30.Determine the Karl Pearson's product moment of coefficient of correlation.

X	4	6	7	11	14	17	21
Y	18	12	13	8	7	7	4

31.Determine the Karl Pearson's product moment of coefficient of correlation..

X	158	296	87	110	436
Y	349	510	301	322	550

32.Find the two regression equation of X on Y and Y on X from the following data:

X	10	12	16	11	15	14	20	22
Y	15	18	23	14	20	17	25	28

33.Compute the regression equation of y on x from the following data.

X	2	4	5	6	8	11
Y	18	12	10	8	7	5

34.Find the regression equation of x on y and predict the value of x when y is 9.

X	3	6	5	4	4	6	7	5
Y	3	2	3	5	3	6	6	4