

# **QUESTION BANK**

## **FOR COMPUTER SCIENCE HONS STUDENTS**

AS PER THE MODEL SYLLABUS  
DEPARTMENT OF HIGHER EDUCATION  
GOVT. OF ODISHA



PREPARED BY  
DEPARTMENT OF COMPUTER SCIENCE  
KENDRAPARA AUTONOMOUS COLLEGE, KENDRAPARA  
(ACCREDITED NAAC `A' GRADE)

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## PROGRAMMING USING C

1. C Program for Find the Number Occurring Odd Number of Times
2. C Program for Largest Sum Contiguous Subarray
3. C Program for Find the Missing Number
4. C Program for Search an element in a sorted and pivoted array
5. C Program for Merge an array of size n into another array of size m+n.
6. C Program for Median of two sorted arrays
7. C Program for Write a program to reverse an array
8. C Program for Program for array rotation
9. C Program for Reversal algorithm for array rotation
10. C Program for Block swap algorithm for array rotation
11. C Program for Maximum sum such that no two elements are adjacent
12. C Program for Leaders in an array
13. C Program for Sort elements by frequency.
14. C Program for Count Inversions in an array
15. C Program for Two elements whose sum is closest to zero
16. C Program for Find the smallest and second smallest element in an array
17. C Program for Find duplicates in  $O(n)$  time and  $O(1)$  extra space
18. C Program for Equilibrium index of an array
19. C Program for Which sorting algorithm makes minimum number of memory writes?
20. C Program for Turn an image by 90 degree
21. C Program for Search in a row wise and column wise sorted matrix
22. C Program for Next Greater Element
23. C Program for Find the smallest missing number
24. C Program for Count the number of occurrences in a sorted array
25. C Program for Binary Search
26. C Program for Selection Sort
27. C Program for Bubble Sort
28. C Program for Insertion Sort
29. C Program for Merge Sort
30. C Program for Heap Sort
31. C Program for QuickSort
32. C Program for Given an array  $arr[]$ , find the maximum  $j - i$  such that  $arr[j] > arr[i]$
33. C Program for Maximum of all subarrays of size k (Added a  $O(n)$  method)
34. C Program for Find whether an array is subset of another array | Added Method 3
35. C Program for Find the minimum distance between two numbers
36. C Program for Find the repeating and the missing | Added 3 new methods
37. C Program for Print a given matrix in spiral form
38. C Program for A Boolean Matrix Question
39. C Program for Median in a stream of integers (running integers)
40. C Program for Find a Fixed Point in a given array
41. C Program for Maximum Length Bitonic Subarray
42. C Program for Find the maximum element in an array which is first increasing and then decreasing
43. C Program for Count smaller elements on right side
44. C Program for Minimum number of jumps to reach end
45. C Program for Implement two stacks in an array
46. C Program for Find subarray with given sum
47. C Program for Dynamic Programming | Set 14 (Maximum Sum Increasing Subsequence)
48. C Program for Longest Monotonically Increasing Subsequence Size ( $N \log N$ )

49. C Program for Find a triplet that sum to a given value
50. C Program for Count the number of possible triangles
51. C Program for Suffix Array | Set 1 (Introduction)
52. C Program for Rearrange an array so that arr[i] becomes arr[arr[i]] with O(1) extra space
53. C Program for Sort n numbers in range from 0 to  $n^2 - 1$  in linear time
54. C Program for Count all possible groups of size 2 or 3 that have sum as multiple of 3
55. What are the basic Datatypes supported in C Programming Language?
56. What do you mean by Dangling Pointer Variable in C Programming?
57. What do you mean by the Scope of the variable? What is the scope of the variables in C?
58. What are static variables and functions?
59. Differentiate between calloc() and malloc()
60. What are the valid places where the programmer can apply Break Control Statement?
61. How can we store a negative integer?
62. Differentiate between Actual Parameters and Formal Parameters.
63. Can a C program be compiled or executed in the absence of a main()?
64. What do you mean by a Nested Structure?
65. What is Preprocessor?
66. Why is C called the Mother of all Languages?
67. Mention the features of C Programming Language.
68. What is the purpose of printf() and scanf() in C Program?
69. What is an array?
70. What is /0 character?
71. What is the main difference between the Compiler and the Interpreter?
72. Can we use int datatype to store 32768 value?
73. How is a Function declared in C Language?
74. What is Dynamic Memory allocation? Mention the syntax.
75. What do you mean by Dangling Pointer Variable in C Programming?
76. Where can we not use &(address operator in C)?
77. Write a simple example of a structure in C Language
78. Differentiate between call by value and call by reference.
79. Differentiate between getch() and getche().
80. Explain toupper() with an example.
81. Write a code to generate random numbers in C Language.
82. Can I create a customized Head File in C language?
83. What do you mean by Memory Leak?
84. Explain Local Static Variables and what is their use?
85. What is the difference between declaring a header file with <> and " " ?
86. When should we use the register storage specifier?
87. Which statement is efficient and why?  $x=x+1$ ; or  $x++$ ; ?
88. Can I declare the same variable name to the variables which have different scopes?
89. Which variable can be used to access Union data members if the Union variable is declared as a pointer variable?
90. Mention File operations in C Language.
91. What are the different storage class specifiers in C?
92. What is typecasting?
93. Write a C program to print hello world without using a semicolon (;).
94. Write a program to swap two numbers without using the third variable.
95. How can you print a string with the symbol % in it?
96. Write a code to print the following pattern.

**1**  
**12**  
**123**  
**1234**  
**12345**

97. Explain the # pragma directive.
98. How can you remove duplicates in an array?
99. What is Bubble Sort Algorithm? Explain with a program.
100. What is Round-robin algorithm? Write a code for Round Robin Scheduling.
101. Which structure is used to link the program and the operating system?
102. What are the limitations of scanf() and how can it be avoided?
103. Differentiate between the macros and the functions.
104. Suppose a global variable and local variable have the same name. Is it possible to access a global variable from a block where local variables are defined?
105. What is the difference between declaration and definition of a variable/function?
106. What are different storage class specifiers in C?
107. How will you print "Hello World" without semicolon?
108. When should we use pointers in a C program?
109. What is NULL pointer?
110. What is Dangling pointer?
111. What is memory leak? Why it should be avoided
112. What are local static variables? What is their use?
113. What are static functions? What is their use?
114. What are main characteristics of C language?
115. What is difference between i++ and ++i?
116. What is l-value?
117. What is the difference between array and pointer?
118. How to write your own sizeof operator?
119. How will you print numbers from 1 to 100 without using loop?
120. What is volatile keyword?
121. Can a variable be both const and volatile?

## DIGITAL LOGIC

1. What is the difference between Combinational and Sequential circuits?
2. Simplify the following logic function  $f(A,B,C) = (A + B + C') \cdot (A + B' + C')$
3. Reduce  $AB + (AC)' + AB'C (AB + C)$
4. Reduce  $A'B'C' + A'BC' + A'BC$
5. Simplify the following expression  $Y = (A + B) (A + C') (B' + C')$
6. Show that  $(X + Y' + XY) (X + Y') (X'Y) = 0$
7. Convert the given expression in canonical SOP form  $Y = AC + AB + BC$
8. Define duality property.
9. Find the complement of the functions  $F1 = x'yz' + x'y'z$  and  $F2 = x (y'z' + yz)$ .
10. By applying De-Morgan's theorem.
11. What are the methods adopted to reduce Boolean function?
12. State the limitations of karnaugh map.
13. What is a karnaugh map?
14. Design a half adder using at most three NOR gates.
15. Explain how a full adder can be built using two half adders.
16. Using 8 to 1 multiplexer, realize the Boolean function  
 $T = f(w, x, y, z) = \Sigma(0,1,2,4,5,7,8,9,12,13)$
17. Design a 4-bit binary adder/ subtractor circuit.
  - a) Basic equations
  - b) Comparison of equations.
18. Design a full adder circuit using only NOR gates
19. Draw the logic diagram of full subtractor and explain its operation.
20. What are called don't care conditions?
21. Define Encoder.
22. Write down the steps in implementing a Boolean function with levels of NAND Gates.
23. Realize a SR flip flop using NAND gates and explain its operation.
24. Realize a JK flip flop using SR flip flop.
25. What is race around condition?
26. Explain EPROM.
27. Explain EEPROM.
28. What is the difference between "Ripple Carry Adder" and "Carry Look-ahead Generator"?
29. How can you implement and/or/not gate using NAND/NOR?
30. What is the difference between flip flop and latches?
31. What is the difference between synchronous reset and asynchronous reset?
32. Design a state machine to detect a stream of "1011" in a serial input stream?
33. How many flip flops are needed to implement a 32 bit register ?
34. Explain the difference between binary and gray encoding and the benefits of each?
35. What is meant by race condition ?
36. Design a circuit to divide a clock by 2 ? and by 3 ?
37. What is 1's complement and 2's complement?
38. Which gates are called universal gates and why?
39. Write short notes on binary number systems?
40. Discuss octal number system?

41. State and prove De-Morgan theorem?
42. Discuss what a logic design is and what do u mean by positive logic system?
43. Convert (4085)<sub>9</sub> into base-5?
44. Write the first 20 decimal digits in base 3?
45. Write the steps involved in unsigned binary subtraction using complements with examples?
46. Explain the addition of two signed binary number along with examples?
47. State and prove idempotent laws of Boolean algebra?
48. Convert  $f(x) = x + y'z$  into canonical form?
49. Write a table stating all the postulates and theorems of Boolean Algebra that are required for logic minimization?
51. Define K-map? Name its advantages and disadvantages?
52. Write the block diagram of 2-4 and 3-8 decoders?
53. What is a flip flop explain its use?
54. What is a latch explain its use?
55. Describe about gated Latch?
56. Describe about master-slave D-flipflop?
57. What is triggering? Write its types.
58. What is T flipflop?
59. Describe about JK flipflop.
60. How to convert JK flipflop to T flipflop and vice versa?
61. What is a register? How is it different from shift register. Explain.
62. What is a counter? Describe about various types of counter?
63. What is decoder? Describe about it.
64. What is a multiplexer? Describe it with diagram.
65. What is sequential circuit? Explain.
66. Explain about finite state model with diagram.
67. What is PLD? Describe.
68. Represent the following decimal number in 7 bit binary sign magnitude form.
  - 14
  - 34
  - 4.5
69. Represent the following decimal number in 7 bit binary 1's complement form.
  - 35
  - 46
  - 43
  - 96
70. Perform the binary addition of the following decimal numbers .
  - 12+14
  - 10+(-8)
  - 16+8
71. What do you mean by semiconductor RAM memory?
72. Describe internal organization of RAM memory.
73. What is static memory?
74. What is programmable logic array? How it differs from ROM?

75. What is mask - programmable?
76. What is field programmable logic array?
77. List the major differences between PLA and PAL
78. Define PLA
79. Define PAL.
80. What is CPLD?
81. What is a FIFO memory?
82. List basic types of programmable logic devices.
83. What is asynchronous DRAM? Describe its internal organization?
84. Distinguish between static memory system and dynamic memory system.
85. Distinguish between SIMMs and DIMMs.
86. What is ROM? Discuss about various types of ROM?
87. What is Flash memory? Discuss about it.
88. Discuss the memory hierarchy of the computer system.
89. What is cache memory? Describe the use of it.
90. Why is memory management required?
91. What is a secondary storage? Discuss its types.
92. What is an input device? Describe its types.
93. What is an output device? Describe its types.
94. Distinguish between synchronous DRAM and asynchronous DRAM.
  
95. What number is always sorted to the top of the list by each pass of the Bubble sort algorithm?
96. How many key comparisons and assignments an insertion sort makes in its worst case?
97. Which sorting algorithm is best if the list is already sorted? Why?
98. Which sorting algorithm is easily adaptable to singly linked lists? Why?
99. Mention the different ways to select a pivot element.
100. What is divide-and-conquer strategy?
101. Compare quick sort and merge sort.
102. Define Searching.
103. What is linear search?
104. What is Binary search?
105. Write an algorithm to implement insertion sort with suitable example.
106. Write an algorithm to implement selection sort with suitable example.
107. Write an algorithm for binary search with suitable example.
108. Write an algorithm to implement Bubble sort with suitable example

## PROGRAMMING IN C++

1. C++ "Hello, World!" Program
  2. C++ Program to Print Number Entered by User
  3. C++ Program to Add Two Numbers
  4. C++ Program to Find Quotient and Remainder
  5. C++ Program to Find Size of int, float, double and char in Your System
  6. C++ Program to Calculate Power of a Number
  7. Increment ++ and Decrement -- Operator Overloading in C++ Programming
  8. C++ Program to Subtract Complex Number Using Operator Overloading
  9. C++ Program to Find ASCII Value of a Character
  10. C++ Program to Multiply two Numbers
- 
11. C++ Program to Check Whether a Number is Palindrome or Not
  12. C++ Program to Check Whether a Number is Prime or Not
  13. C++ Program to Display Prime Numbers Between Two Intervals
  14. C++ Program to Check Armstrong Number
  15. C++ Program to Display Armstrong Number Between Two Intervals
  16. C++ Program to Display Factors of a Number
  17. C++ Programs To Create Pyramid and Pattern
  18. C++ Program to Make a Simple Calculator to Add, Subtract, Multiply or Divide Using switch...case
  19. C++ Program to Display Prime Numbers Between Two Intervals Using Functions
  20. C++ Program to Find the Frequency of Characters in a String
  21. C++ Program to Find the Number of Vowels, Consonants, Digits and White Spaces in a String
  22. C++ Program to Remove all Characters in a String Except Alphabets.
  23. C++ Program to Find the Length of a String
  24. C++ Program to Concatenate Two Strings
  25. C++ Program to Copy Strings
  26. C++ Program to Sort Elements in Lexicographical Order (Dictionary Order)
  27. C++ Program to Store Information of a Student in a Structure
  28. C++ Program to Add Two Distances (in inch-feet) System Using Structures
  29. C++ Program to Add Complex Numbers by Passing Structure to a Function
  30. C++ Program to Calculate Difference Between Two Time Period
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31. C++ Program for Check for Majority Element in a sorted array
  32. C++ Program for Maximum and minimum of an array using minimum number of comparisons
  33. C++ Program for Segregate 0s and 1s in an array
  34. C++ Program for k largest(or smallest) elements in an array | added Min Heap method
  35. C++ Program for Maximum size square sub-matrix with all 1s
  36. C++ Program for Maximum difference between two elements such that larger element appears after the smaller number
  37. C++ Program for Union and Intersection of two sorted arrays
  38. C++ Program for Floor and Ceiling in a sorted array
  39. C++ Program for A Product Array Puzzle
  40. C++ Program for Segregate Even and Odd numbers
  41. C++ Program for Find the two repeating elements in a given array
  42. C++ Program for Sort an array of 0s, 1s and 2s
  43. C++ Program for Find the Minimum length Unsorted Subarray, sorting which makes the complete array sorted
  44. C++ Program for Find duplicates in  $O(n)$  time and  $O(1)$  extra space
  45. C++ Program for Equilibrium index of an array

46. C++ Program for Which sorting algorithm makes minimum number of memory writes?
47. C++ Program for Turn an image by 90 degree
48. C++ Program for Search in a row wise and column wise sorted matrix
49. C++ Program for Next Greater Element
50. C++ Program for Check if array elements are consecutive | Added Method 3
51. C++ Program for Find the smallest missing number
52. C++ Program for Count the number of occurrences in a sorted array
53. C++ Program for Binary Search
54. C++ Program for Selection Sort
55. C++ Program for Bubble Sort
56. C++ Program for Insertion Sort
57. C++ Program for Merge Sort
58. C++ Program for Heap Sort
59. C++ Program for QuickSort
60. C++ Program for Given an array arr[], find the maximum  $j - i$  such that  $arr[j] > arr[i]$
61. C++ Program for Maximum of all subarrays of size k (Added a  $O(n)$  method)
62. C++ Program for Find whether an array is subset of another array | Added Method 3
63. C++ Program for Find the minimum distance between two numbers
64. C++ Program for Find the repeating and the missing | Added 3 new methods
65. C++ Program for Print a given matrix in spiral form
66. C++ Program for A Boolean Matrix Question
67. C++ Program for Median in a stream of integers (running integers)
68. C++ Program for Find a Fixed Point in a given array
69. C++ Program for Maximum Length Bitonic Subarray
70. C++ Program for Find the maximum element in an array which is first increasing and then decreasing
71. C++ Program for Count smaller elements on right side
72. C++ Program for Minimum number of jumps to reach end
73. C++ Program for Iterative Quick Sort
74. C++ Program for Inplace M x N size matrix transpose | Updated
75. What is C++?
76. What is namespace in C++?
77. How to input string in C++?
78. What is operator overloading in C++?
79. What is the difference between C and C++?
80. How to reverse a string in C++?
81. What is template in C++?
82. What is using namespace std in C++?
83. What is pointer in C++?
84. What is function in C++?
85. What is destructor in C++?
86. How to dynamically allocate a 2d array in C++ ?
87. How to use goto statement in C++ ?
88. What is function overriding in C++ ?
89. Which operator cannot be overloaded in C++ ?
90. How to copy and paste in turbo C++ ?
91. Why C++?
92. What is bool in C++?
93. What is exception in C++ ?
94. How to set decimal places in C++ ?

95. How to get absolute value in C++?
96. What is the difference between C++ and Java?
97. How to concatenate string in C++ ?
98. How to convert char to int in C++ ?
99. How to generate random numbers in C++ with a range?
100. What is stack in C++?
101. What is conio.h in C++?
102. What are character constants in C++?
103. What are templates in C++?
104. How to sort vector in C++?
105. What is pure virtual function in C++?
106. How to use map in C++?
107. How to empty a vector in C++?
108. What is visual C++?
109. How to remove segmentation fault in C++?
110. What is stl in C++ with example?
111. What is flush in C++?
112. How to initialize a 2d vector in C++?
113. How to input a string in C++?
114. What is virtual function in C++?
115. How to find length of array in C++?
116. What is virtual base class in C++?
117. How to access private members of a class in C++?
118. How to call base class constructor from derived class in C++?
119. What is an abstract class in C++?
120. What is containership in C++?
121. What is data hiding in C++?
122. What is runtime polymorphism in C++?
123. What is copy constructor in C++?
124. How is modularity introduced in C++?

## DATA STRUCTURE

1. What is the data structure?
2. Difference between file structure and storage structure
3. When is a binary search best applied?
4. What do you mean by linked list?
5. In what areas data structures can be applied?
6. What do you understand by LIFO?
7. What is the queue?
8. What do you mean by binary trees?
9. Which data structures are meant to be applied while dealing with a recursive function?
10. What do you mean by a stack?
11. Explain binary search tree.
12. What are multidimensional arrays?
13. What can be linked lists considered as: linear or non-linear data structures?
14. List the ways how dynamic memory allocation helps in managing data.
15. What do you understand by FIFO?
16. What is an ordered list?
17. What do you understand by merge sort?
18. Differentiate between NULL and VOID.
19. List out the primary advantages of linked list.
20. What's the difference between a PUSH and a POP?
21. What is a linear search?
22. How does the variable declaration affect memory allocation?
23. List out the advantages that can come when the heap is over a stack.
24. What do you understand by postfix expression?
25. What does data abstraction mean?
26. How to insert a new item in the binary search tree?
27. What are the ways in which a selection sort works for an array?
28. What are the operations that can be performed on a stack?
29. Write the stack overflow condition.
30. What is the difference between PUSH and POP?
31. Write the steps involved in the insertion and deletion of an element in the stack.
32. What is a postfix expression?
33. Write the postfix form of the expression:  $(A + B) * (C - D)$
34. Which notations are used in Evaluation of Arithmetic Expressions using prefix and postfix forms?
35. How to reference all the elements in a one-dimension array?
36. What is a multidimensional array?
37. Define Linked List Data structure.
38. What are the advantages of Linked List over an array?
39. Write the syntax in C to create a node in the singly linked list.
40. What is doubly linked list?
41. List some applications of queue data structure.
42. What are the drawbacks of array implementation of Queue?

43. What are the scenarios in which an element can be inserted into the circular queue?
44. What is a dequeue?
45. What is the minimum number of queues that can be used to implement a priority queue?
46. List the types of tree.
47. Write the C code to perform in-order traversal on a binary tree.\
48. What is the maximum number of nodes in a binary tree of height k?
49. Which data structure suits the most in the tree construction?
50. State the properties of B Tree.
51. How can AVL Tree be useful in all the operations as compared to Binary search tree?
52. What are the differences between B tree and B+ tree?
53. List some applications of Tree-data structure?
54. Define the graph data structure?
55. Differentiate among cycle, path, and circuit?
56. Mention the data structures which are used in graph implementation.
57. Which data structures are used in BFS and DFS algorithm?
58. What are the applications of Graph data structure?
59. What are the advantages of Binary search over linear search?
60. What are the advantages of Selection Sort?
61. What is the difference between NULL and VOID?
62. What are linear and non-linear data Structures?
63. How to check if a given Binary Tree is BST or not?
64. What is the circular linked list?
65. What is the circular linked list?
66. What is the advantage of an ADT?
67. What is the advantage of an ADT?
68. Explain the usage of stack in recursive algorithm implementation?
69. Write the postfix form for the expression -A+B-C+D?
70. How do you test for an empty Queue?
71. Define Circular Queue.
72. Write an algorithm for Push and Pop operations on Stack using Linked list.
73. Define an efficient representation of two stacks in a given area of memory with n words and explain.
74. Define Height of tree?
75. Define Depth of tree?
76. Define sibling?
77. What are the two methods of binary tree implementation?
78. Define expression tree?
79. Define tree– traversal and mention the type of traversals?
80. Define in -order traversal?
81. What is AVL Tree?
82. Define complete binary tree.
83. Construct an expression tree for the expression  $(a+b*c) + ((d*e+f)*g)$ . Give the outputs when you apply inorder, preorder and postorder traversals.
84. Define adjacency matrix?

86. Define adjacent nodes?
87. What is meant by strongly connected in a graph?
88. Name the different ways of representing a graph? Give examples.
89. What is the use of BFS?
90. Write BFS algorithm
91. What are the two traversal strategies used in traversing a graph?
92. Explain the various applications of Graphs.
93. List the different sorting algorithms
94. What is meant by Sorting?
95. What number is always sorted to the top of the list by each pass of the Bubble sort algorithm?
96. How many key comparisons and assignments an insertion sort makes in its worst case?
97. Which sorting algorithm is best if the list is already sorted? Why?
98. Which sorting algorithm is easily adaptable to singly linked lists? Why?
99. Mention the different ways to select a pivot element.
100. What is divide-and-conquer strategy?
101. Compare quick sort and merge sort.
102. Define Searching.
103. What is linear search?
104. What is Binary search?
105. Write an algorithm to implement insertion sort with suitable example.
106. Write an algorithm to implement selection sort with suitable example.
107. Write an algorithm for binary search with suitable example.
108. Write an algorithm to implement Bubble sort with suitable example

## JAVA PROGRAMMING

1. How to reverse a String in java? Can you write a program without using any java inbuilt methods?
2. Write a java program to check if two Strings are anagram in java?
3. Write a program to check if String has all unique characters in java?
4. How to check if one String is rotation of another String in java?
5. How to find duplicate characters in String in java?
6. Find first non repeated character in String in java?
7. Find all substrings of String in java?
8. Find length of String without using any inbuilt method in java?
9. Write a program to print all permutations of String in java?
10. Write java Program to Find Smallest and Largest Element in an Array.
11. Find missing number in the array.
12. Search an element in rotated and sorted array.
13. Find minimum element in a sorted and rotated array.
14. Find second largest number in an array
15. Find the number occurring odd number of times in an array
16. Find minimum number of platforms required for railway station
17. Find a Pair Whose Sum is Closest to zero in Array
18. Given a sorted array and a number x, find the pair in array whose sum is closest to x
19. Find all pairs of elements from an array whose sum is equal to given number
20. Given an array of 0's and 1's in random order, you need to separate 0's and 1's in an array.
21. Separate odd and even numbers in an array
22. Given an array containing zeroes, ones and twos only. Write a function to sort the given array in  $O(n)$  time complexity.
23. Find local minima in array
24. Sliding window maximum in java
25. Count number of occurrences (or frequency) of each element in a sorted array
26. Find subarrays with given sum in an array.
27. Find peak element in the array.
28. Find leaders in an array.
29. Count 1's in sorted Binary Array.
30. Find first repeating element in an array of integers.
31. Check if Array Elements are Consecutive.
32. Permutations of array in java.
33. Rotate an array by K positions.
34. Stock Buy Sell to Maximize Profit.
35. Find maximum difference between two elements such that larger element appears after the smaller number.
36. Search in a row wise and column wise sorted matrix.
37. Largest sum contiguous subarray.
38. Find the Contiguous Subarray with Sum to a Given Value in an array.
39. Longest Common Prefix in an array of Strings in java.
40. Find all subsets of set (power set) in java.
41. Implement a stack using array.
42. Implement a stack using Linked List.
43. Implement a stack using two queues.
44. Sort an stack using another stack
45. Implement Queue using Array in java.

46. Implement a stack using two queues .
47. Implement singly linked list in java.
48. How to reverse linked list in java.
49. How to find middle element of linked list.
50. How to find nth element from end of linked list .
51. How to detect a loop in linked list. If linked list has loop, find the start node for the loop.
52. How to check if linked list is palindrome or not?
53. Find intersection of two linked lists?
54. How to reverse a linked list in pairs?
55. Implement Doubly linked list in java?
56. How can you traverse binary tree?
57. Write an algorithm to do level order traversal of binary tree?
58. Write an algorithm to do spiral order traversal of binary tree?
59. How can you print leaf nodes of binary tree?
60. How to count leaf nodes of binary tree.
61. How to print all paths from root to leaf in binary tree.
62. How to find level of node in binary tree
63. How to find maximum element in binary tree.
64. How to find lowest common ancestor(LCA) in binary tree.
65. How to do boundary traversal of binary tree.
66. How to print vertical sum of binary tree?
67. Count subtrees with Sum equal to target in binary tree?
68. What is binary search tree?
69. Can you write algorithm to insert a node in binary search tree.
70. Can you write algorithm to delete a node in binary search tree.
71. How can you find minimum and maximum elements in binary search tree?
72. How to find lowest common ancestor(LCA) in binary search tree.
73. Find inorder successor in a Binary search Tree
74. Convert sorted array to balanced BST
75. Convert sorted Linked List to balanced BST
76. Check if a binary tree is binary search tree or not in java
77. Write an algorithm to implement bubble sort?
78. Write an algorithm to implement insertion sort sort?
79. Write an algorithm to implement selection sort sort?
80. Can you write algorithm for merge sort and also do you know complexity of merge sort?
81. Do you know how to implement Heap sort?
82. Implement quick sort in java?
83. Implement shell sort in java?
84. Implement Counting sort in java?
85. What is binary search? Can you write an algorithm to find an element in sorted array using binary search?
86. Write algorithm to do depth first search in a graph.
87. Write algorithm to do breadth first search in a graph.
88. Explain Dijkstra algorithm from source to all other vertices.
89. Explain Bellman Ford algorithm to find shortest distance
90. Explain Kruskal's algorithm for finding minimum spanning tree
91. Given two String, find longest common substring.
92. Given two Strings A and B. Find the length of the Longest Common Subsequence (LCS) of the given Strings.

93. Given a matrix, we need to count all paths from top left to bottom right of MxN matrix. You can either move down or right.
94. Edit Distance Problem in java
95. Coin change problem in java
96. Minimum number of jumps to reach last index
97. What is an algorithm and how to calculate complexity of algorithms.
98. Implement trie data structure in java.
99. Count Factorial Trailing Zeroes in java.
100. Largest Rectangular Area in a Histogram.
101. Check for balanced parentheses in an expression in java.
102. What is Memoization.

## **DATABASE MANAGEMENT SYSTEMS**

1. Define Database.
2. What is DBMS?
3. What are the various kinds of interactions catered by DBMS?
4. Segregate database technology's development.
5. Who proposed the relational model?
6. What are the features of Database language?
7. What do database languages do?
8. Define database model.
9. What is SQL?
10. Enlist the various relationships of database.
11. Define Normalization.
12. Enlist the advantages of normalizing database.
13. Define Denormalization.
14. Define DDL and DML.
15. Enlist some commands of DDL.
16. Define Union All operator and Union.
17. Define cursor.
18. Enlist the cursor types.
19. Enlist the types of cursor.
20. Define sub-query.
21. Why is group-clause used?
22. Compare Non-clustered and clustered index.
23. Define Aggregate functions.
24. Define Scalar functions.
25. What restrictions can you apply when you are creating views?
26. Define "correlated subqueries".
27. Define Data Warehousing.
28. Define Join and enlist its types.
29. What do you mean by Index hunting?
30. How does Index hunting help in improving query performance?
31. Enlist the disadvantages of query.
32. Enlist ways to efficiently code transactions.
33. What is Executive Plan?
34. Define B-trees.
35. Differentiate Table Scan from Index Scan.
36. What do you mean by Fill Factor concept with respect to indexes?
37. Define Fragmentation.
38. Differentiate Nested Loop, Hash Join and Merge Join.
39. What is Database partitioning?
40. Explain the importance of partitioning.
41. Define Database system.
42. What do you mean by Query Evaluation Engine?
43. Define DDL Interpreter.

44. Define Atomicity and Aggregation.
45. Enlist the various transaction phases.
46. Define Object-oriented model.
47. Define Entity.
48. What do you mean by Entity type?
49. Define Entity Set.
50. What do you mean by Entity type extension?
51. What is DBMS?
52. What is a database?
53. What is a database system?
54. What are the advantages of DBMS?
55. What is a checkpoint in DBMS?
56. When does checkpoint occur in DBMS?
57. What do you mean by transparent DBMS?
58. What are the unary operations in Relational Algebra?
59. What is RDBMS?
60. How many types of database languages are?
61. What do you understand by Data Model?
62. Define a Relation Schema and a Relation.
63. What is a degree of Relation?
64. What is the Relationship?
65. What are the disadvantages of file processing systems?
66. What is data abstraction in DBMS?
67. What are the three levels of data abstraction?
68. What is DDL (Data Definition Language)?
69. What is DML (Data Manipulation Language)?
70. Explain the functionality of DML Compiler.
71. What is Relational Algebra?
72. What is Relational Calculus?
73. What do you understand by query optimization?
74. What do you mean by durability in DBMS?
75. What is normalization?
76. What is Denormalization?
77. What is functional Dependency?
78. What is the E-R model?
79. What is an entity?
80. What is an Entity type?
81. What is an Entity set?
82. What is an Extension of entity type?
83. What is Weak Entity set?
84. What is an attribute?
85. What are the integrity rules in DBMS?
86. What do you mean by extension and intension?

87. What is System R? How many of its two major subsystems?
88. What is Data Independence?
89. What are the three levels of data abstraction?
90. What is Join?
91. What is 1NF?
92. What is 2NF?
93. What is 3NF?
94. What is BCNF?
95. Explain ACID properties
96. What is stored procedure?
97. What is the difference between a DELETE command and TRUNCATE command?
98. What is 2-Tier architecture?
99. What is the 3-Tier architecture?
100. How do you communicate with an RDBMS?
101. What is the difference between a shared lock and exclusive lock?
102. Describe the types of keys?
103. What are the issues of traditional file-based systems that make DBMS a superior alternative?
104. What are some examples of open source and commercial Relational DBMSs?
105. What is a database model? and name a few common database models?
106. How do you choose a database model?
107. What is ER modeling?
108. What is NoSQL?
109. What is ACID properties of transactions?
110. What are the different levels of data abstraction?
111. What are OLTP and OLAP and their differences?
112. What is normalization and de-normalization?
113. What is Data Warehousing?
114. What is "lock escalation"?
115. What is "lock contention"?
116. What is "deadlock"?
117. What are isolation levels?
118. What is B+ tree and its advantages and disadvantages?
119. What is the difference between clustered and non-clustered indexes?
120. What are different JOIN algorithms?
121. What is stored procedure?
122. What is a database trigger?
123. What is an execution plan?
124. What is query optimization?
125. Mention a few best practices to improve query performance?
126. What is Write-Ahead Log (WAL)?
127. What is a checkpoint?
128. What is a distributed database?
129. What is database partitioning?

130. What is database sharding?
131. What are different types of SQL statements?
132. What is the difference of DDL and DML?
133. What is the difference between scalar and aggregate functions?
134. What is database VIEW?
135. What is the difference between VIEW and materialized VIEW?
136. What is Common Table Expressions (CTE)?
137. What are the differences between DROP and TRUNCATE commands?
138. What are the differences between DELETE and TRUNCATE commands?
139. What are the differences between PRIMARY KEY and FOREIGN KEY?
140. What is the difference between WHERE and HAVING clause?
141. What is functional dependency?
142. What are different normalization types?
143. What are different integrity rules?
144. What is DML Compiler?
145. What is cursor?
146. What is cardinality?







**+3 2<sup>ND</sup> YEAR 4<sup>TH</sup> SEMESTER  
PAPER - CORE - VIII**

## OPERATING SYSTEM

1. What are the objectives of operating system?
2. What are the advantages of peer-to-peer systems over client-server systems?
3. What is the purpose of system programs/system calls?
4. How does an interrupt differ from a trap?
5. What are disadvantages of multi-processor systems?
6. Define timesharing differ from multiprogramming?
7. Why API's need to be used rather than system call?
8. Compare and contrast DMA and cache memory.
9. Distinguish between batch systems and time sharing systems.
10. Compare tightly coupled systems and loosely coupled systems?
11. What is real time system?
12. What are privileged instructions?
13. What do you mean by system calls?
14. Define: process
15. What is process control block?
16. What is scheduler?
17. What are the use of job queues, ready queues and device queues?
18. What is meant by context switch?
19. Discuss the difference between symmetric and asymmetric multiprocessing
20. What is the main advantage of multiprogramming?
21. Discuss the main advantages of layered approach to system design?
22. List the advantage of multiprocessor system?
23. Define inter process communication.
24. Identify the difference between mainframe and desktop operating system.
25. What is bootstrap program?
26. Illustrate the different interrupt clauses.
27. Identify what virtual machine is and what are the advantages virtual machines.
28. Distinguish between hard real time systems and soft real time systems.
29. Summarize the functions of DMA
30. Illustrate the use of fork and exec system calls.
31. Define: Clustered systems.
32. Some computer systems do not provide a privileged mode of operation in hardware. Is it possible to construct a secure operating system for these computer systems?
33. Can traps be generated intentionally by a user program? If so, for what purpose?
34. What are the three main purposes of an operating system?
35. What is the purpose of system calls?
36. What are the five major activities of an operating system with regard to process management?
37. What are the three major activities of an operating system with regard to memory management?
38. What are the three major activities of an operating system with regard to secondary storage management?
39. What is an Operating system?
40. List the services provided by an Operating System?

41. What is the Kernel?
42. What is meant by Mainframe Systems?
43. What is Multiprocessor System?
44. What are the advantages of multiprocessors?
45. What is the use of Fork and Exec System Calls?
46. What are the five major categories of System Calls?
47. What are the modes of operation in Hardware Protection?
48. What is meant by Batch Systems?
49. List the privileged instruction.
50. What are the Components of a Computer System?
51. Explain the various types of system calls with examples.
52. Explain the concept of multiprocessor and Multicore organization.
53. What are the advantages and disadvantages of using the same system call interface for both files and devices.
54. Discuss in detail about Distributed systems.
55. Demonstrate the three methods for passing parameters to the OS with examples.
56. Explain how protection is provided for the hardware resources by the operating system.
57. Compare and contrast Single-threaded and multi-threaded process.
58. Priority inversion is a condition that occurs in real time systems – Analyzing on this statement.
59. Distinguish between CPU bounded, I/O bounded processes.
60. What resources are required to Creating threads?
61. Under what circumstances user level threads are better than the kernel level threads?
62. What is the meaning of the term busy waiting?
63. List out the data fields associated with process control blocks.
64. Define the term ‘Dispatch Latency’.
65. What is the concept behind strong semaphore and spinlock?
66. What is a thread?
67. What are the benefits of multithreaded programming?
68. Compare user threads and kernel threads.
69. What is the use of fork and exec system calls?
70. What are the different ways in which a thread can be cancelled?
71. Define CPU Scheduling.
72. Distinguish between preemptive and nonpreemptive Scheduling.
73. List the functions of Dispatcher Module.
74. What are the various scheduling criteria for CPU scheduling?
75. What are the requirements that a solution to the critical section problem must satisfy?
76. Define: Critical section problem.
77. How will you calculate turn-around time?
78. What is a semaphore?
79. Define Deadlock.
80. What are the conditions under which a deadlock situation may arise?
81. What are the methods for handling deadlocks?
82. What is resource-allocation graph?
83. What are the benefits of synchronous and asynchronous communication?

84. Define process?
85. Describe the actions taken by a kernel to contextswitch between kernel level threads.
86. What is meant by the state of the process?
87. Define process control block contain?
88. What are the 3 different types of scheduling queues?
89. What are the types of scheduler?
90. Define Starvation in deadlock?
91. Name some classic problem of synchronization?
92. What is the sequence of operation by which a process utilizes a resource?
93. Give the condition necessary for a deadlock situation to arise?
94. Define 'Safe State'?
95. Define race condition.
96. Define entry section and exit section.
97. What is the difference between user-level instructions and privileged instructions?
98. Define: Belady's anomaly?
99. What is the purpose of paging the page table?
100. Why page sizes are always power of 2?
101. List two differences between logical and physical addresses.
102. Define demand paging in memory management.
103. What are the steps required to handle a page fault in demand paging?
104. What do you meant by thrashing?
105. Explain dynamic loading.
106. Explain dynamic linking.
107. Define Overlays.
108. Define swapping.
109. What is Demand Paging?
110. What is pure demand paging?
111. Outline about virtual memory.
112. Define lazy swapper.
113. What are the common strategies to select a free hole from a set of available holes?
114. Define effective access time.
115. What is the basic approach for page replacement?
116. Distinguish between page and segment.
117. How the problem of external fragmentation can be solved.
118. Evaluating the maximum number of pages needed If a system supports 16 bit address line and 1K page size.
119. How does the system discover thrashing?
120. What you mean by compaction? In which situation is it applied.
121. Outline about TLB.
122. List the need of inverted page table.
123. Define Address binding.
124. List the steps needed to handle page fault.
125. Define External Fragmentation.
126. How is memory protected in a paged environment?

127. What are the major problems to implement Demand paging?
128. What is Internal Fragmentation?
129. What do you mean by Compaction?
130. What are Pages and Frames?
131. What is the use of Valid-Invalid Bits in Paging?
132. What is the basic method of Segmentation?
133. What is a Reference String?
134. Define Secondary Memory.
135. What is the basic approach of Page Replacement?
136. What are the various Page Replacement Algorithms used for Page Replacement?
137. What do you mean by Best Fit?
138. What do you mean by First Fit?
139. Distinguish file from dictionary.
140. Why is it important to scale up system bus and device speed as CPU speed increases?
141. Define C-SCAN scheduling.
142. How does DMA increase system concurrency?
143. List the various file attributes.
144. What is HSM? Where is it used?
145. What are the functions of Virtual File System (VFS) layer in file system implementation?
146. What is a file?
147. What are the various file operations?
148. What are the informations associated with an open file?
149. What are the different accessing methods of a file?
150. Examine how an index file is used to speed up the access in direct-access files?
151. Explain what ISAM is?
152. What are the allocation methods of a disk space?
153. List various layers of a file system.
154. Define seek time and latency time.
155. Define rotational latency and disk bandwidth.
156. How free-space is managed using bit vector implementation? List its advantages.
157. Define Spooling.
158. What are the various disk-scheduling algorithms?
159. What is the use of boot block?
160. List three ways of allocating storage, and give advantages of each
161. What is Access Control List?
162. What is the cause of Thrashing? How does the system detect thrashing?
163. What is Belady's Anomaly?
164. What are the advantages of Contiguous Allocation?
165. What are the disadvantages of Linked Allocation?
166. What are the various Disk-Scheduling Algorithms?

**PAPER - CORE - IX**  
**COMPUTER NETWORK**

1. What is the purpose of communication model? Name the various components of data communication system
2. What are types of transmission media ?/Differentiate guided and unguided transmission media ?
3. What are the two types of transmission technology
4. Differentiate Point to Point and multipoint connection
5. What is a protocol? What are the key elements of a protocol?
6. Define Simplex, Half Duplex, Full Duplex transmission system.(Different transmission mode) What is continuous (analog) signal and discrete signal(digital)?
7. What is attenuation ?
8. What is channel capacity /data rate?
9. What are the factors that determine channel capacity?
10. State Nyquist formulation for multilevel signaling.
11. What is Layered Network Architecture?
12. What is the need for layering?
13. Compare OSI and Internet Protocol. How do layers of the internet model correlate to the layers of the OSI model./List the layers of TCP/IP
14. Each layer has distinct functions. Why flow control & error control is duplicated in different layers.
15. What are the functions of physical layer of IEEE 802 reference model?
16. List the common topologies available for LAN.
17. What are the uses of Network?
18. What are the types or categories of network?
19. Differentiate LAN and MAN
20. What are Gateways?
21. Define Shanon Capacity formula
22. What is the channel capacity for a teleprinter channel with a 300-Hz bandwidth and a signal-to-noise ratio of 3 dB?
23. A digital signaling system is required to operate at 9600 bps.
24. a. If a signal element encodes a 4-bit word, what is the minimum required bandwidth of the channel?
25. b. Repeat part (a) for the case of 8 bit words.
26. We can calculate the theoretical highest bit rate of a regular telephone line. A telephone line normally has a bandwidth of 3000 Hz (300 Hz to 3300 Hz).
27. The signal-to-noise ratio is usually 3162. For this channel the capacity is calculated as ?
28. How many lines are required to connect n – systems in Direct Mesh topology?
29. Define the terms: OSI and TCP/IP
30. What is 10base5?
31. Differentiate Ethernet and Fast Ethernet
32. List some factors that determine whether the communication system is a LAN or WAN.
33. What is CSMA/CD?
34. What does IEEE 10 Base 5 standard signify?

35. What is the use of data link layer in OSI?
36. Define Flow Control and error control.
37. Why sliding window flow control is considered to be more efficient than stop and wait .
38. Name any error checking / correction mechanism in data link control.
39. Define piggybacking.
40. Differentiate between lost frame and damaged frame?
41. What are the two sub layers of Data Link Layer and their functions
42. What is preamble?
43. When a transmitting station will insert a new token on the ring?
44. What is a bridge? List the functions of a bridge?
45. List the reason for using bridges in LAN.
46. What are the limitations of bridges?
47. What is spanning tree routing?
48. What are different types of bridge?
49. Compare FDDI with token ring 802.5.
50. Ethernet stipulates a minimum size of a frame. Why is it necessary?
51. What is meant by the contention period of Ethernet?
52. Define Repeater, Hub.
53. What is meant by Exponential back of algorithm?
54. What is the access method used in wireless LAN.
55. What is transparent bridge ?
56. Compare CSMA/CD and CSMA/CA
57. Compare rate based flow control and feedback based flow control
58. Draw the Ethernet frame format.
59. Mention the layers where gateway, router, switch, hub functions?
60. Differentiate Physical Address and Logical Address.
61. What are the various classes of IP addresses? / Define various levels of addressing in Internet.
62. Give the characteristics of connectionless (datagram) network.
63. What do you mean by ICMP? To whom ICMP reports error message.
64. Differentiate Packet Switching and circuit Switching
65. Differentiate SVC from PVC.
66. Define a switch and a bridge.
67. Name any two network connecting devices? Can a bridge replace repeater for interconnecting 2 segments of a n/w?
68. Which class IP addresses are used for multicast and unicast?
69. Classify the following addresses.  
23.8.8.9 -----  
127.24.34.56 -----  
159.78.9.10 -----
70. What is IP address?
71. Define Router.
72. What does a router do when it receives a packet with a destination address that it does not have an entry for, in its routing table?
73. List out functions of IP.

74. What is the use of TTL in IP header? / What is the router's role in controlling the packet lifetime ?
75. What are the important fields in a routing table?
76. What is Trace route option? Record Route/ Trace Route
77. Write the difference between Distance vector routing and Link state routing.
78. List some of the unicast routing protocols.
79. State the goals of Network layer.
80. How broadcast and multicast address is represented in IP addressing scheme?
81. What does the term 'cost' refer to in routing?
82. What is meant by fixed routing or static routing?
83. List out the three basic steps involved in data communication through circuit switching.
84. Define datagram.
85. What are the routing strategies?
86. What is the similarity/difference between a Bridge and a router?
87. What is the difference between IPV4 and IPV6? Write down the advantages of IPV6 over IPV4 .
88. What is dynamic routing? Or Adaptive routing?
89. What is Subnet?
90. What is the main difference between TCP & UDP?
91. Define Channelization.
92. What is sequence number in TCP segment?
93. Differentiate between Congestion and collision.
94. Give any two Transport layer service.
95. How an application process running in one host is addressed by another process through TCP.
96. What is silly window syndrome?
97. What is the various adaptive retransmission policy of TCP.
98. What do you mean by congestion?
99. Name the policies that can prevent congestion.
100. Give Datagram Format of UDP.
101. How do transport services differ from the data link layer services?
102. Define Slow start mechanism. / What is meant by slow start in TCP ?
103. List out various congestion control techniques
104. Distinguish between Contention and Congestion.
105. Define Flow control.
106. List the SNMP functions. Need of SNMP
107. Give the two types of connections provided by FTP.
108. Write any two applications of network.
109. What are the two methods of HTTP
110. What are the advantages of stateless server of HTTP?
111. What is the use of MIME Extension?
112. Give the advantages of Email.
113. What are the features of email.
114. Which protocol support email and give details about that protocol.
115. What is cipher text and Plain text?
116. What is authentication?

117. Write different classification of DNS servers.
118. Mention the components of SNMP model.
119. What are the functions of presentation layer?
120. How does a DNS resolver bootstrap the domain name look up process?
121. What is firewall?

1. List the operating characteristics for the following display technologies : Raster refresh systems, Vector refresh system, Plasma panels, LCDs
2. List some applications for several display technologies.
3. Determine the resolution (pixels/cm) in the X and Y directions for the video monitor in use on our system. Determine the aspect ratio and explain how relative proportions of objects can be maintained in our system.
4. Compare the advantages and disadvantages of a 3D monitor using a varifocal mirror with a stereoscopic system.
5. List the different input and output devices that are used with virtual-reality system.
6. Explain how users interact with a virtual scene displayed with different output devices.
7. Explain how virtual-reality systems can be used in design applications.
8. Mention some applications for virtual-reality system.
9. List some applications for large-screen displays.
10. Explain the basic concepts of line-drawing algorithm.
11. Explain DDA line drawing algorithm.
12. Explain Bresenham's line-drawing algorithm.
13. Explain parallel line algorithm.
14. Explain mid point circle algorithm.
15. Explain midpoint ellipse algorithm.
16. Explain scan-line polygon fill algorithm.
17. Mention the attributes of graphics primitives.
18. Modify Bresenham's line-drawing algorithm to display either solid, dashed or dotted lines.
19. Devise a parallel method for implementing the line-type function.
20. Define and implement a function for controlling the line type (solid, dashed, dotted) of displayed ellipses.
21. Implement an antialiasing procedure for the midpoint line algorithm.
22. Write the transformation matrix for translation, rotation, scaling, reflection and shear.
23. Write the homogeneous system of transformation matrix for translation, scaling, rotation, reflection and shear.
24. Derive the transformation matrix for rotation about a fixed point.
25. Derive the transformation matrix for reflection about a line  $y = mx + c$ .
26. Show that the composition of two rotations is additive by concatenating the matrix for  $R(\theta_1)$  and  $R(\theta_2)$  to obtain  

$$R(\theta_1) \cdot R(\theta_2) = R(\theta_1 + \theta_2)$$
27. Show that two successive reflections about the line passing through the coordinate origin is equivalent to a single rotation about the origin.
28. What is two dimensional viewing. Write the viewing pipeline process.
29. What is window and viewport? Write about different coordinate system.
30. Write the window-to-viewport transformation process.
31. Define clipping, world-coordinate clipping and viewport clipping.
32. Explain Inside-outside test for line clipping.
33. Explain Cohen-Sutherland line clipping algorithm.
34. Define convex and concave polygon.
35. Explain Sutherland-Hodgeman polygon clipping algorithm.
36. Explain Weiler-Atherton polygon clipping algorithm.

37. Write the several 3D transformation matrices for translation, rotation, scaling, shearing.
38. Define projection and its types.
39. Differentiate between parallel and perspective projections.
40. Derive the plane equations in 3D-object representation.
41. Derive the equations of several quadratic surfaces.
42. Derive the equation of superquadrics surface.
43. What is spline representation? Explain parametric continuity and geometric continuity conditions.
44. Explain Hermite interpolation method.
45. Explain Kochanek-Bartels spline method.
46. Explain the process of Bezier curves.
47. Explain the properties and design techniques of Bezier curves.
48. Define visible surface detection method and its types.
49. Describe the backface detection method.
50. Describe the image space approach for depth buffer method.
51. Describe the extension of depth-buffer method.
52. Explain A-Buffer method.
53. Explain scan-line method.
54. Describe the depth sorting method in brief.
55. Describe the technique behind area subdivision method.
56. Explain Ray-Casting method.
57. What is illumination model?
58. Define surface rendering algorithm.
59. Describe the process of basic illumination model.
60. Explain the process of Phong model.
61. Explain the process of Warn model.
62. Define halftone and halftoning. Describe the process of halftone approximations.
63. Explain the dithering technique.
64. Briefly describe the process of constant intensity shading.
65. Explain the process of Gouraud shading in polygon rendering.
66. Explain Phong shading in polygon rendering method.
67. Define ray-tracing and explain basic ray tracing algorithm.
68. Explain space subdivision method.
69. Write notes on :antialiased ray tracing, distributed ray tracing.

**+3 3<sup>RD</sup> YEAR 5<sup>TH</sup> SEMESTER**  
**PAPER – CORE XI**  
**WEB TECHNOLOGY**

1. How to comment HTML tags?
2. How to create a hyperlink?[More on this]
3. How to author an abbreviation or an acronym?
4. What is the correct way to write address in an HTML document?
5. How to create an area inside an image-map?[More on this]
6. Create an HTML document which uses article element?
7. Create an HTML document which uses aside element?
8. How to embed audio in a HTML document?[More on this]
9. How to write bold text using HTML tags?
10. How to specify the base URL/target for all relative URLs in a document?
11. How to override the current text direction?
12. How to define a section that is quoted from another source?
13. How to define the document's body?
14. How to define a single line break?
15. How to define a clickable button?[more on this]
16. How to draw graphics, on the fly, via scripting?[more on this]
17. How to define a table caption?
18. How to define the title of an HTML document?
19. How to specify the column properties of each column within a colgroup element?
20. How to define a piece of code?[more on this]
21. How to specify a list of pre-defined options for input controls?
22. How to define a description/value of a term in a description list?
23. How to semantically delete text from an HTML document?[more on this]
24. How to define additional details that the user can view or hide?
25. How to represent the defining instance of a term?
26. How to define a dialog box or window with an HTML tag?
27. How to define a section in a document?
28. How to define a definition list?
29. How to define a term or name in a definition list?
30. How to emphasize text in an HTML document?
31. How to define a container for an external (non-HTML) application?
32. How to groups related elements in a form?
33. How to define a caption for a figure element?
34. How to specify self-contained content?
35. How to define a footer for a document or section?
36. How to define an HTML form for user input?
37. How to define an HTML heading?
38. How to define information about the document?
39. How to define a header for a document or section?
40. How to define a thematic change in the content?
41. How to define the root of an HTML document?
42. How to define a part of text in an alternate voice or mood?
43. How to define an inline frame? [more on this]
44. How to define an image? [more on this]
45. How to define an input control? [more on this]

46. How to define a text that has been inserted into a document? [more on this]
47. How to define a keyboard input?
48. How to define a key-pair generator field (for forms)?[more on this]
49. How to define a label for an input element?[more on this]
50. How to define a caption for a fieldset element?
51. How to define a list item?
52. How to define the relationship between a document and other resources?
53. How to specify the main content of a document?
54. How to define a section in a document?
55. How to define a drop-down list?[more on this]
56. How to define smaller text?
57. How to define multiple media resources for media elements?[more on this]
58. How to define a section in a document?
59. How to define important text?
60. How to define style information for a document?[more on this]
61. How to define subscripted text?
62. How to define a visible heading for a details element?
63. How to define superscripted text?
64. How to define a table?
65. How to group the body content in a table?
66. How to define a cell in a table?
67. How to define a multiline input control text area?
68. How to group the footer content in a table?
69. How to define a header cell in a table?[more on this]
70. How to group the header content in a table?
71. How to define a title for the document?
72. How to define a row in a table?
73. How to underline a text in an HTML document?
74. How to define an unordered list?
75. How to define a variable?
76. How to define a video or movie?[more on this]
77. What are the different data types present in javascript?
78. Explain Hoisting in javascript.
79. Difference between “==” and “===” operators.
80. Explain Implicit Type Coercion in javascript.
81. Is javascript a statically typed or a dynamically typed language?
82. What is NaN property in JavaScript?
83. Explain passed by value and passed by reference.
84. What is an Immediately Invoked Function in javascript?
85. Explain Higher Order Functions in javascript.
86. Explain “this” keyword.
87. Explain call(), apply() and, bind() methods.
88. What is Currying in javascript?
89. Explain Scope and Scope Chain in javascript.
90. Explain Closures in JavaScript.
91. What are object prototypes?
92. What are callbacks?
93. What is memoization?
94. What is recursion in a programming language?
95. What is the use of a constructor function in javascript?

96. What is DOM?
97. What are arrow functions?
98. Differences between declaring variables using var, let and const.
99. What is the rest parameter and spread operator?
100. What is the use of promises in javascript?
101. What are classes in javascript?
102. What are generator functions?
103. Explain WeakSet in javascript.
104. Explain WeakMap in javascript.
105. What is Object Destructuring?
106. What is a Temporal Dead Zone?
107. JavaScript Program To Print Hello World
108. JavaScript Program to Add Two Numbers
109. JavaScript Program to Convert the First Letter of a String into UpperCase
110. JavaScript Program to Count the Number of Vowels in a String
111. JavaScript Program to Remove a Property from an Object
112. JavaScript Program to Check Whether a String Starts and Ends With Certain Characters
113. JavaScript Program to Check if a Key Exists in an Object
114. JavaScript Program to Clone a JS Object.
115. What are the disadvantages of using CSS?
116. Name a few prominent CSS frameworks.
117. What is the difference between the usage of an ID and a Class?
118. What is the RGB stream?
119. What are the ways to assign a certain colour to an element in CSS?
120. Explain the CSS Box Model and its different elements.
121. What is the z-index in CSS?
122. What are CSS Sprites?
123. Mention a few benefits of using CSS Sprites.
124. What are pseudo-elements in CSS?
125. How will you target an h2 and h3 with the same styling?
126. What is the float property used for in CSS?
127. What are the different modules used in the current version of CSS?
128. What are the different media types allowed by CSS?
129. What are the different units used in CSS?
130. What are the different ways to position a certain element in CSS?
131. What is Block Formatting Context? How does it work?
132. What effect would this piece of CSS code have? `{box-sizing: border-box;}`
133. What is a CSS pre-processor? When do you recommend a pre-processor be used in a project?
134. What's the difference between a relative, fixed, absolute and statically positioned element?
135. What are Vendor-Prefixes?
136. Give an example of how you would use counter-increment and counter-reset in CSS to create automatic numbering within a webpage.
137. What is file splitting? When is it used?
138. What are *functions/mixins*?
139. How to write PHP code in different ways?
140. How to write comments in PHP?
141. How to use Codeignitor (PHP)?
142. How to turn off PHP Notices?
143. How to use '<?=' short open tag in PHP programming?
144. How to insert a new item in an array on any position in PHP?

145. How to append one array to another in PHP?

146. Write a program for this pattern

```
*  
* *  
* * *  
* * * *  
* * * * *
```

147. Write a program for this pattern ?

```
*****  
*****  
*****  
*****  
*****
```

148. How to find a factorial of a number ?

149. How to find whether a number prime or not ?

150. How to find whether a number armstrong or not ?

151. How to find whether a year leap year or not ?

152. How to print a number reverse ?

153. Swap two values without third variable ?

**+3 3<sup>RD</sup> YEAR 5<sup>TH</sup> SEMESTER**  
**PAPER – CORE XII**  
**SOFTWARE ENGINEERING**

1. What are the important categories of software?
2. What is the main difference between a computer program and computer software?
3. What is software re-engineering?
4. Describe the software development process in brief:
5. What are SDLC models available?
6. What is verification and validation?
7. In software development process what is the meaning of debugging?
8. How can you make sure that your code is both safe and fast?
9. Name two tools which are used for keeping track of software requirements?
10. What is the main difference between a stubs, a mock?
11. What language do you like to write programming algorithms?
12. What is computer software?
13. According to you which SDLC model is the best?
14. Who is software project manager? What is his role?
15. What is mean by software scope?
16. How to find the size of a software product?
17. What are function points?
18. What are software project estimation techniques available?
19. What is Software configuration management?
20. How can you measure project execution?
21. Tell me about some project management tools.
22. Mentions some software analysis & design tools?
23. What is mean by level-0 Data flow diagram?
24. What is the major difference between structured English and Pseudo Code?
25. What is structured design?
26. What is functional programming?
27. What is Quality Assurance vs. Quality Control?
28. What are CASE tools?
29. Which process model removes defects before software get into trouble?
30. How you can make sure that your written code which can handle various kinds of error situation?
31. Explain the differences between a Thread and a Process?
32. Tell me the difference between an EXE and a DLL?
33. What is strong-typing and weak-typing? Which is preferred? Why?
34. Describe the difference between Interface-oriented, Object-oriented and Aspect-oriented programming.
35. Why using catch (exception) is always a bad idea?
36. What type of data is passed via HTTP Headers?
37. How do you prioritize requirements?

38. Give me differences between object-oriented and component-based design?
39. When do you use polymorphism?
40. What is the difference between stack and queue?
41. What is essential for testing the quality of the code?
42. Do you think that the maintenance of software is expensive?
43. Give me differences between tags and branches?
44. Where is a protected class-level variable available?
45. Is it possible to execute multiple catch blocks for a single try statement?
46. When do you need to declare a class as abstract?
47. Develop an algorithm that output your current location and a list of ATMs locations in that area. Get you the closest K ATMs to your location.
48. Explain the different phases involved in waterfall life cycle.
49. What is feasibility study? What are the contents we should contain in the feasibility report?
50. What is feasibility study? What are the contents we should contain in the feasibility report?
51. What are the purposes of Data Flow diagrams, Entity-Relationship diagrams? Give an example diagram of each.
52. What is Software Engineering?
53. What are the elements to be considered in the System Model Construction?
54. What does a System Engineering Model accomplish?
55. Define Framework.
56. What are the characteristics of the software?
57. What are the various categories of software?
58. What are the challenges in software?
59. Define Software process.
60. What are the internal milestones?
61. What is the limitation of RAD Model?
62. What are the disadvantages of classic life cycle model?
63. What are the merits of the incremental model?
64. What is the disadvantage of the spiral model?
65. Name the Evolutionary process Models.
66. Define Software Prototyping.
67. What are the benefits of prototyping?
68. What are the prototyping methods in software process?
69. What are the advantages of evolutionary prototyping?
70. What are the various Rapid prototyping techniques?
71. What are the uses of User-Interface Prototyping?
72. Define System Context Diagram (SCD)?
73. Define Quality Function Deployment (QFD)?
74. What is Requirement Engineering?
75. What is ERD?
76. What is DFD?
77. What is a state transition diagram?
78. What is Software Quality Assurance?

79. What is the use of CMM?
80. What is coupling?
81. What is cohesion?
82. Define Refactoring.
83. What is Software Architecture?
84. Define Stamp coupling.
85. Define common coupling.
86. Define temporal cohesion.
87. Define metrics.
88. What is COCOMO model?
89. What is the purpose of the timeline chart?
90. Define Smoke Testing?
91. What are the benefits of Smoke Testing?
92. What is Equivalence Partition?
93. What are the steps followed in testing?
94. Distinguish between Alpha and Beta testing.
95. What are the types of Static Testing tools?
96. Define maintenance.
97. What are the types of software maintenance?
98. What is CASE Tools?
99. What is Risk management?
100. What is SDLC?
101. What are the various models available in SDLC?
102. Explain the term Baseline.
103. What are the responsibilities of a Software Project Manager?
104. What is Cohesion?
105. What is Coupling?
106. Explain the concept of Modularization.
107. What is Software Configuration Management?
108. What are the various phases of SDLC?
109. Provide examples of Project Management tools.
110. What are CASE tools?
111. What is Black box testing?
112. What is White box testing?
113. What is a Feasibility Study?
114. How can you measure Project execution?
115. What are the Functional Requirements?
116. What are Non-Functional Requirements?
117. What is the difference between Quality Assurance and Quality Control?
118. What is the difference between Verification and Validation?
119. Which SDLC model is the best to choose for a Software Product?
120. What do you mean by Software Scope?
121. What is SRS?

122. What is the SDLC model that you have used in your previous project?
123. Explain the Waterfall model in detail.
124. Explain V-Model in detail.

**+3 3<sup>RD</sup> YEAR 5<sup>TH</sup> SEMESTER**  
**PAPER – DSE -I**  
**NUMERICAL ANALYSIS**

1. Solving an engineering problem requires four steps. In order of sequence the four steps are
  - A. formulate, model, solve, implement
  - B. formulate, solve, model, implement
  - C. formulate, model, implement, solve
  - D. model, formulate, implement, solve
2. One of the roots of the equation  $x^3 - 3x^2 + x - 3 = 0$  is
  - A. -1
  - B. 1
  - C.  $\sqrt{3}$
  - D. 3
3. The solution to the set of equations
$$25a + b + c = 25$$
$$64a + 8b + c = 71$$
$$144a + 12b + c = 155$$
most nearly is  $(a, b, c) =$ 
  - A. (1,1,1)
  - B. (1,-1,1)
  - C. (1,1,-1)
  - D. does not have a unique solution.
4. The exact integral of
$$\int_0^{\frac{\pi}{4}} 2\cos 2x dx$$
is most nearly ?
5. The value of  $\frac{dy}{dx}(1.0)$ , given  $y = 2\sin(3x)$  most nearly is
  - A. -5.9399
  - B. -1.980
  - C. 0.31402
  - D. 5.9918
6. The form of the exact solution of the ordinary differential equation
$$2\frac{dy}{dx} + 3y = 5e^{-x}, y(0) = 5$$
is
  - A.  $Ae^{-1.5x} + Be^x$
  - B.  $Ae^{-1.5x} + Be^{-x}$
  - C.  $Ae^{1.5x} + Be^{-x}$
  - D.  $Ae^{-1.5x} + Bxe^{-x}$

7. Truncation error is caused by approximating
- irrational numbers
  - fractions
  - rational numbers
  - exact mathematical procedures
8. A computer that represents only 4 significant digits with chopping would calculate  $66.666 \times 33.333$  as
- 2220
  - 2221
  - 2221.17778
  - 2222
9. The truncation error in calculating  $f'(2)$  for  $f(x) = x^2$  by  $f'(x) \approx \frac{f(x+h) - f(x)}{h}$  with  $h = 0.2$  is
- 0.2
  - 0.2
  - 4.0
  - 4.2
10. The truncation error in finding  $\int_{-3}^9 x^3 dx$  using LRAM (left end point Riemann approximation) with equally portioned points  $-3 < 0 < 3 < 6 < 9$  is
- 648
  - 756
  - 972
  - 1620
11. The number  $1/10$  is registered in a fixed 6 bit-register with all bits used for the fractional part. The difference gets accumulated every  $1/10^{\text{th}}$  of a second for one day. The magnitude of the accumulated difference is
- 0.082
  - 135
  - 270
  - 5400
12. True error is defined as
- Present Approximation – Previous Approximation
  - True Value – Approximate Value
  - abs (True Value – Approximate Value)
  - abs (Present Approximation – Previous Approximation)
13. The expression for true error in calculating the derivative of  $\sin(2x)$  at  $x = \pi/4$  by using the approximate expression  $f'(x) \approx \frac{f(x+h) - f(x)}{h}$  is
- $\frac{h - \cos(2h) - 1}{h}$
  - $\frac{h - \cos(h) - 1}{h}$

- C.  $\frac{1 - \cos(2h)}{h}$   
 D.  $\frac{\sin(2h)}{h}$

14. The relative approximate error at the end of an iteration to find the root of an equation is 0.004% . The least number of significant digits we can trust in the solution is  
 A. 2  
 B. 3  
 C. 4  
 D. 5
15. The number  $0.01850 \times 10^3$  has \_\_\_\_\_ significant digits  
 A. 3  
 B. 4  
 C. 5  
 D. 6
16. The following gas stations were cited for irregular dispensation by the Department of Agriculture. Which one cheated you the most?

Station	Actual gasoline dispensed	Gasoline reading at pump
Ser	9.90	10.00
Cit	19.90	20.00
Hus	29.80	30.00
She	29.95	30.00

- A. Ser  
 B. Cit  
 C. Hus  
 D. She
17. The number of significant digits in the number 219900 is  
 A. 4  
 B. 5  
 C. 6  
 D. 4 or 5 or 6
18.  $(25)_{10} = (?)_2$   
 A. 100110  
 B. 10011  
 C. 11001  
 D. 110010
19.  $(1101)_2 = (?)_{10}$   
 A. 3  
 B. 13  
 C. 15

- D. 26
20.  $(25.375)_{10} = (?.?)_2$   
 A. 100110.011  
 B. 11001.011  
 C. 10011.0011  
 D. 10011.110
21. Representing  $\sqrt{2}$  in a fixed point register with 2 bits for the integer part and 3 bits for the fractional part gives a round-off error of most nearly  
 A. -0.085709  
 B. 0.0392  
 C. 0.1642  
 D. 0.2892
22. An engineer working for the Department of Defense is writing a program that transfers non-negative real numbers to integer format. To avoid overflow problems, the maximum non-negative integer that can be represented in a 5-bit integer word is  
 A. 16  
 B. 31  
 C. 63  
 D. 64
23. For a numerically controlled machine, integers need to be stored in a memory location. The minimum number of bits needed for an integer word to represent all integers between 0 and 1024 is  
 A. 8  
 B. 9  
 C. 10  
 D. 11
24. A hypothetical computer stores real numbers in floating point format in 8-bit words. The first bit is used for the sign of the number, the second bit for the sign of the exponent, the next two bits for the magnitude of the exponent, and the next four bits for the magnitude of the mantissa. The number  $e \cong 2.718$  in the 8-bit format is
25. A hypothetical computer stores real numbers in floating point format in 8-bit words. The first bit is used for the sign of the number, the second bit for the sign of the exponent, the next two bits for the magnitude of the exponent, and the next four bits for the magnitude of the mantissa. The number that  $(10100111)_2$  represented in the above given 8-bit format is
26. A hypothetical computer stores floating point numbers in 8-bit words. The first bit is used for the sign of the number, the second bit for the sign of the exponent, the next two bits for the magnitude of the exponent, and the next four bits for the magnitude of the mantissa. The machine epsilon is most nearly
27. A machine stores floating point numbers in 7-bit word. The first bit is used for the sign of the number, the next three for the biased exponent and the next three for the magnitude of the mantissa. The number  $(00101110)_2$  represented in base-10 is
28. A machine stores floating point numbers in 7-bit words. The first bit is stored for the sign of the number, the next three for the biased exponent and the next three for the magnitude of the mantissa. You are asked to represent 33.35 in the above word. The error you will get in this case would be  
 A. underflow  
 B. overflow

- C. NaN
- D. No error will be registered.

29. A hypothetical computer stores floating point numbers in 9-bit words. The first bit is used for the sign of the number, the second bit for the sign of the exponent, the next three bits for the magnitude of the exponent, and the next four bits for the magnitude of the mantissa. Every second, the error between 0.1 and its binary representation in the 9-bit word is accumulated. The accumulated error after one day most nearly is
- A. 0.002344
  - B. 20.25
  - C. 202.5
  - D. 8640
30. If  $A = 3.56 \pm 0.05$  and  $B = 3.25 \pm 0.04$ , the values of  $A + B$  are
31. A number  $A$  is correctly rounded to 3.18 from a given number  $B$ . Then  $|A - B| \leq C$ , where  $C$  is
32. Two numbers  $A$  and  $B$  are approximated as  $C$  and  $D$ , respectively. The relative error in  $C \times D$  is given by

- A.  $\left| \left( \frac{A-C}{A} \right) \right| \times \left| \left( \frac{B-D}{B} \right) \right|$
- B.  $\left| \left( \frac{A-C}{A} \right) \right| + \left| \left( \frac{B-D}{B} \right) \right| + \left| \left( \frac{A-C}{A} \right) \right| \times \left| \left( \frac{B-D}{B} \right) \right|$
- C.  $\left| \left( \frac{A-C}{A} \right) \right| + \left| \left( \frac{B-D}{B} \right) \right| - \left| \left( \frac{A-C}{A} \right) \right| \times \left| \left( \frac{B-D}{B} \right) \right|$
- D.  $\left( \frac{A-C}{A} \right) - \left( \frac{B-D}{B} \right)$

33. The formula for normal strain in a longitudinal bar is given by  $\epsilon = \frac{F}{AE}$  where

$F$  = normal force applied

$A$  = cross-sectional area of the bar

$E$  = Young's modulus

If  $F = 50 \pm 0.5 \text{ N}$ ,  $A = 0.2 \pm 0.002 \text{ m}^2$ , and  $E = 210 \times 10^9 \pm 1 \times 10^9 \text{ Pa}$ , the maximum error in the measurement of strain is

34. A wooden block is measured to be 60 mm by a ruler and the measurements are considered to be good to 1/4th of a millimeter. Then in the measurement of 60 mm, we have \_\_\_\_\_ significant digits.
35. In the calculation of the volume of a cube of nominal size 5", the uncertainty in the measurement of each side is 10%. The uncertainty in the measurement of the volume would be
36. The definition of the first derivative of a function  $f(x)$  is

- A.  $f'(x) = \frac{f(x + \Delta x) + f(x)}{\Delta x}$
- B.  $f'(x) = \frac{f(x + \Delta x) - f(x)}{\Delta x}$

- C.  $f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) + f(x)}{\Delta x}$
- D.  $f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$
37. Given  $y = 5e^{3x} + \sin x$ ,  $\frac{dy}{dx}$  is
- A.  $5e^{3x} + \cos x$   
 E.  $15e^{3x} + \cos x$   
 F.  $15e^{3x} - \cos x$   
 G.  $2.666e^{3x} - \cos x$
38. Given  $y = \sin 2x$ ,  $\frac{dy}{dx}$  at  $x = 3$  is most nearly
- A. 0.9600  
 B. 0.9945  
 C. 1.920  
 D. 1.989
39. Given  $y = x^3 \ln x$ ,  $\frac{dy}{dx}$  is
- A.  $3x^2 \ln x$   
 B.  $3x^2 \ln x + x^2$   
 C.  $x^2$   
 D.  $3x$
40. The velocity of a body as a function of time is given as  $v(t) = 5e^{-2t} + 4$ , where  $t$  is in seconds, and  $v$  is in m/s. The acceleration in  $\text{m/s}^2$  at  $t = 0.6$  s is
- A. -3.012  
 B. 5.506  
 C. 4.147  
 D. -10.00
41. If  $x^2 + 2xy = y^2$ , then  $\frac{dy}{dx}$  is
42. The definition of the first derivative of a function  $f(x)$  is
- A.  $f'(x) = \frac{f(x + \Delta x) + f(x)}{\Delta x}$   
 B.  $f'(x) = \frac{f(x + \Delta x) - f(x)}{\Delta x}$   
 C.  $f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) + f(x)}{\Delta x}$   
 D.  $f'(x) = \lim_{\Delta x \rightarrow 0} \frac{f(x + \Delta x) - f(x)}{\Delta x}$
43. The exact derivative of  $f(x) = x^3$  at  $x = 5$  is most nearly
44. Using the forward divided difference approximation with a step size of 0.2, the derivative of  $f(x) = 5e^{2.3x}$  at  $x = 1.25$  is

45. A student finds the numerical value of  $\frac{d}{dx}(e^x) = 20.220$  at  $x = 3$  using a step size of 0.2.

Which of the following methods did the student use to conduct the differentiation?

- A. Backward divided difference  
 B. Calculus, that is, exact  
 C. Central divided difference  
 D. Forward divided difference
46. Using the backward divided difference approximation,  $\frac{d}{dx}(e^x) = 4.3715$  at  $x = 1.5$  for a step size of 0.05. If you keep halving the step size to find  $\frac{d}{dx}(e^x)$  at  $x = 1.5$  before two significant digits can be considered to be at least correct in your answer, the step size would be (you cannot use the exact value to determine the answer)
- A.  $0.05/2$   
 B.  $0.05/4$   
 C.  $0.05/8$   
 D.  $0.05/16$
47. Using the forward divided difference approximation with a step size of 0.2, the derivative of the function at  $x = 2$  is given as

$x$	1.8	2.0	2.2	2.4	2.6
$f(x)$	6.0496	7.3890	9.0250	11.023	13.464

- A. 6.697  
 B. 7.389  
 C. 7.438  
 D. 8.180
48. A student finds the numerical value of  $f'(x) = 20.220$  at  $x = 3$  using a step size of 0.2. Which method did the student use to conduct the differentiation if  $f(x)$  is given in the table below?

$x$	2.6	2.8	3.0	3.2	3.4	3.6
$f(x)$	$e^{2.6}$	$e^{2.8}$	$e^3$	$e^{3.2}$	$e^{3.4}$	$e^{3.6}$

49. The upward velocity of a body is given as a function of time as

$t, s$	10	15	20	22
$v, m/s$	22	36	57	10

To find the acceleration at  $t = 17 s$ , a scientist finds a second order polynomial approximation for the velocity, and then differentiates it to find the acceleration. The estimate of the acceleration in  $m/s^2$  at  $t = 17 s$  is most nearly

- A. 4.060  
B. 4.200  
C. 8.157  
D. 8.498
50. The value of  $x$  that satisfies  $f(x) = 0$  is called the  
A. root of an equation  $f(x) = 0$   
B. root of a function  $f(x)$   
C. zero of an equation  $f(x) = 0$   
D. none of the above
51. A quadratic equation has \_\_\_\_\_ root(s).
52. For a certain cubic equation, at least one of the roots is known to be a complex root. How many total complex roots does the cubic equation have?
53. An equation such as  $\tan x = x$  has \_\_\_\_\_ root(s).
54. A polynomial of order  $n$  has \_\_\_\_\_ zeros.
55. The velocity of a body is given by  $v(t) = 5e^{-t} + 4$ , where  $t$  is in seconds and  $v$  is in m/s. The velocity of the body is 6 m/s at  $t =$  \_\_\_\_\_ seconds.  
A. 0.1823  
B. 0.3979  
C. 0.9163  
D. 1.609
56. The bisection method of finding roots of nonlinear equations falls under the category of a (an) \_\_\_\_\_ method.  
A. open  
B. bracketing  
C. random  
D. graphical
57. If  $f(x)$  is a real continuous function in  $[a, b]$ , and  $f(a)f(b) < 0$ , then for  $f(x) = 0$ , there is (are) \_\_\_\_\_ in the domain  $[a, b]$ .
58. Assuming an initial bracket of  $[1, 5]$ , the second (at the end of 2 iterations) iterative value of the root of  $te^{-t} - 0.3 = 0$  using the bisection method is  
A. 0  
B. 1.5  
C. 2  
D. 3
59. To find the root of  $f(x) = 0$ , a scientist is using the bisection method. At the beginning of an iteration, the lower and upper guesses of the root are  $x_l$  and  $x_u$ . At the end of the iteration, the absolute relative approximate error in the estimated value of the root would be  
A.  $\left| \frac{x_u}{x_u + x_l} \right|$

B.  $\left| \frac{x_\lambda}{x_u + x_\lambda} \right|$

C.  $\left| \frac{x_u - x_\lambda}{x_u + x_\lambda} \right|$

D.  $\left| \frac{x_u + x_\lambda}{x_u - x_\lambda} \right|$

60. For an equation like  $x^2 = 0$ , a root exists at  $x = 0$ . The bisection method cannot be adopted to solve this equation in spite of the root existing at  $x = 0$  because the function  $f(x) = x^2$
- is a polynomial
  - has repeated roots at  $x = 0$
  - is always non-negative
  - has a slope equal to zero at  $x = 0$
61. The Newton-Raphson method of finding roots of nonlinear equations falls under the category of \_\_\_\_\_ methods.
62. The Newton-Raphson method formula for finding the square root of a real number  $R$  from the equation  $x^2 - R = 0$  is,
- $x_{i+1} = \frac{x_i}{2}$
  - $x_{i+1} = \frac{3x_i}{2}$
  - $x_{i+1} = \frac{1}{2} \left( x_i + \frac{R}{x_i} \right)$
  - $x_{i+1} = \frac{1}{2} \left( 3x_i - \frac{R}{x_i} \right)$
63. The next iterative value of the root of  $x^2 - 4 = 0$  using the Newton-Raphson method, if the initial guess is 3, is
64. The root of the equation  $f(x) = 0$  is found by using the Newton-Raphson method. The initial estimate of the root is  $x_0 = 3$ ,  $f(3) = 5$ . The angle the line tangent to the function  $f(x)$  makes at  $x = 3$  is  $57^\circ$  with respect to the  $x$ -axis. The next estimate of the root,  $x_1$  most nearly is
65. The root of  $x^3 = 4$  is found by using the Newton-Raphson method. The successive iterative values of the root are given in the table below.

Iteration Number	Value of Root
0	2.0000
1	1.6667
2	1.5911
3	1.5874
4	1.5874

The iteration number at which I would first trust at least two significant digits in the answer is

- A. 1
- B. 2
- C. 3
- D. 4

**+3 3<sup>RD</sup> YEAR 5<sup>TH</sup> SEMESTER**  
**PAPER – DSE -II**  
**UNIX OPERATING SYSTEM**

1. Explain Unix Architecture
2. Define a single-user system.
3. Name a few significant features of UNIX?
4. Can you write a command to erase all files in the current directory including all its sub-directories?
5. Describe a link in UNIX.
6. Describe pipes in Unix
7. In Shell scripting, how do you separate the grep and egrep?
8. What is the fork() system call?
9. What is meant by the term Super User?
10. What do chmod, chown, chgrp commands do?
11. Can you name the important standard streams in the UNIX shell scripting?
12. What is the 'nohup' in UNIX?
13. Differentiate between swapping and paging?
14. What is a daemon?
15. Can you explain the method of changing file access permission?
16. Explain the process model of Unix?
17. Explain the term filter.
18. What can you tell about shell variables?
19. What do you know about the MBR?
20. Explain the file system in UNIX
21. In shell scripting, what is the significance of the Shebang line?
22. Can you enlist some commonly used network commands?
23. Explain a path in UNIX and different types of pathnames.
24. Explain Superblock in UNIX.
25. Enlist some file manipulation commands in UNIX.
26. Explain networking stack and protocol.
27. Explain the alias mechanism.
28. What is a wildcard and how is it used?
29. What are system calls and library functions in terms of Unix commands?
30. Explain Virtual memory
31. Explain the kill() system call and its return values?
32. Name the various commands that are used for the user information in UNIX.
33. Explain mount and unmount commands.
34. What is the difference between ps -ef and ps -auxwww?
35. What is the Zombie process in UNIX? How do you find the Zombie process?
36. Explain system bootup in UNIX.
37. What are different classes of jobs?
38. What are the various IDs in UNIX processes?
39. Which path refers to the exact path as referenced from the root directory.
40. Which network commands are used for information gathering in UNIX?
41. Which listing command is used to show files in a long format, one file per line in the listing directory
42. What command will change your prompt to MYPROMPT:
43. Which command is used for remote login?
44. Which command is a user switching command?

45. Which command is used to find which operating system your system is running on in UNIX?
46. What is a typical syntax being followed when issuing commands in shell?
47. What is the chief difference between the `-v` and `-x` options to `set`?
48. What is Kernel?
49. What is Shell?
50. What are the key features of the Korn Shell?
51. What are some common shells and what are their indicators?
52. What is command substitution?
53. What is a directory?
54. What is inode?
55. Briefly describe the Shell's responsibilities
56. What is Bash Shell?
57. What is the use of `-l` when listing a directory?
58. What is piping?
59. What is a superuser?
60. What is pid?
61. What is the output of this command? `$who | sort -logfile>newfile`
62. How do you switch from any user type to a super user type?
63. What would be the effect of changing the value of PATH to: `./usr/della/bin: /bin: /usr/bin`
64. Write a command that will output the sorted contents of a file named IN.TXT and place the output in another file named OUT.TXT, while at the same time excluding duplicate entries.
65. Describe the usage and functionality of the command "`rm -r *`" in UNIX?
66. What are the links and symbolic links in a UNIX file system?
67. How to perform a system shutdown in UNIX?
68. What are hidden files in UNIX?
69. How to create files in UNIX?
70. How to calculate the number of words in a file?
71. How to create a blank file in UNIX?
72. How to know the present working directory in UNIX?
73. How to know the information about a file?
74. How to move files from one directory to other in UNIX?
75. How to copy files from one directory to other in UNIX?
76. How to remove files in UNIX?
77. How to remove the directory in UNIX?
78. How can we execute a shell script if execute bit is off for a shell script?
79. Which filter can be used to display first 10 lines of a file?
80. What is a zombie process?

**+3 3<sup>RD</sup> YEAR 6<sup>TH</sup> SEMESTER**  
**PAPER – CORE XIII**  
**ARTIFICIAL INTELLIGENCE**

1. What do you understand by Artificial Intelligence?
2. Why do we need Artificial Intelligence?
3. Give some real-world applications of AI.
4. How Artificial intelligence, Machine Learning, and Deep Learning differ from each other?
5. What are the types of AI?
6. What are the different domains/Subsets of AI?
7. What are the types of Machine Learning?
8. Explain the term "Q-Learning."
9. What is Deep Learning, and how is it used in real-world?
10. Which programming language is used for AI?
11. What is the intelligent agent in AI, and where are they used?
12. How is machine learning related to AI?
13. What is Markov's Decision process?
14. What are parametric and non-parametric model?
15. What is Strong AI, and how is it different from the Weak AI?
16. Give a brief introduction to the Turing test in AI?
17. Which assessment is used to test the intelligence of the machine?
18. What is overfitting? How can it be overcome in Machine Learning?
19. Tell one technique to avoid overfitting in neural networks?
20. What is NLP? What are the various components of NLP?
21. What are the different components of the Expert System?
22. What is the use of computer vision in AI?
23. Explain the minimax algorithm along with the different terms.
24. What is game theory? How is it important in AI?
25. What are some misconceptions about AI?
26. What are the eigenvalues and eigenvectors?
27. Give a brief introduction of partial, alternate, artificial, and compound keys?
28. What is a Chatbot?
29. What is knowledge representation in AI?
30. What are the various techniques of knowledge representation in AI?
31. Which programming language is not generally used in AI, and why?
32. What is reinforcement learning?
33. What are the different areas where AI has a great impact?
34. What are the different software platforms for AI development?
35. Kindly explain different ways to evaluate the performance of the ML model.
36. Explain rational agents and rationality?
37. What is tensor flow, and how it is used in AI?
38. Give the steps for A\* algorithm?
39. What is the inference engine, and why it is used in AI?
40. What do you understand by the fuzzy logic?
41. What is a Bayesian network, and why is it important in AI?

42. What is a heuristic function, and where is it used?
43. What are the Examples of AI in real life?
44. What is ANN?
45. Difference between AI, ML, and DL?
46. How to choose an algorithm for a problem?
47. What is Tower of Hanoi?
48. What is Turing test?
49. What is an expert system? What are the characteristics of an expert system?
50. List the advantages of an expert system.
51. What is an A\* algorithm search method?
52. What is a breadth-first search algorithm?
53. What is a depth-first search algorithm?
54. What is a bidirectional search algorithm?
55. What is an iterative deepening depth-first search algorithm?
56. What is a uniform cost search algorithm?
57. How are game theory and AI related?
58. Explain Alpha–Beta pruning.
59. What is a fuzzy logic?
60. List the applications of fuzzy logic.
61. What is a partial-order planning?
62. What is FOPL?
63. What is the difference between inductive, deductive, and abductive Machine Learning?
64. List the different algorithm techniques in Machine Learning.
65. Differentiate between supervised, unsupervised, and reinforcement learning.
66. What is a Backpropagation Algorithm?
67. How route weights are optimized to reduce the error in the model?
68. What is perceptron in Machine Learning?
69. List the extraction techniques used for dimensionality reduction.
70. Is KNN different from K-means Clustering?
71. List the steps involved in Machine Learning.
72. Define F1 score.
73. Can you name three feature selection techniques in Machine Learning?
74. What is a recommendation system?
75. What methods are used for reducing dimensionality?
76. List different methods for sequential supervised learning.
77. What are the advantages of neural networks?
78. What is Bias–Variance tradeoff?
79. What is a cost function?
80. What are the steps involved in the gradient descent algorithm?

**+3 3<sup>RD</sup> YEAR 6<sup>TH</sup> SEMESTER**  
**PAPER – CORE XIV**  
**(DESIGN AND ANALYSIS OF ALGORITHMS)**

1. Define algorithm and its characteristics.
2. Describe the concept of Insertion sort along with its pseudocode and analyze its time complexity.
3. Describe the concept of Merge sort along with its pseudocode and analyze its time complexity.
4. Write the pseudocode for finding maximum and minimum element in an array.
5. Write the pseudocode for selection sort and bubble sort algorithms.
6. What is asymptotic analysis? Describe several asymptotic notations.
7. Define the concept of divide and conquer approach for designing algorithm.
8. Let  $f(n)$  and  $g(n)$  be asymptotically nonnegative functions. Using the basic definition of  $\Theta$ -notation, prove that  $\max(f(n),g(n)) = \Theta(f(n) + g(n))$ .
9. Show that for any real constants  $a$  and  $b$ , where  $b > 0$ ,  $(n+a)^b = \Theta(n^b)$ .
10. Prove that the running time of an algorithm is  $\Theta(g(n))$  if and only if its worst case running time is  $O(g(n))$  and its best case running time is  $\Omega(g(n))$ .
11. Prove that  $n^2 + n = \Theta(n^2)$ .
12. Show that  $2n^3 + 5n + 3 = O(n^3)$ .
13. Show that  $5n^2 + 4n + 1 = \Omega(n^2)$ .
14. Show that  $4n^2 + 2n + 6 = \Theta(n^2)$ .
15. Prove from the definition of small- $o$  that  $n = o(n^2)$ .
16. Show that the solution of  $T(n) = T(n/2) + 1$  is  $O(\lg n)$ .
17. Show that the solution of  $T(n) = T(n-1) + n$  is  $O(n^2)$ .
18. Show that the solution of  $T(n) = T(n/2 + 17) + n$  is  $O(n \lg n)$ .
19. Using master method solve the following recurrences.
20.  $T(n) = 2 T(n/4) + 1$
21.  $T(n) = 2 T(n/4) + \sqrt{n}$
22.  $T(n) = 2 T(n/4) + n$
23.  $T(n) = 2 T(n/4) + n^2$
24.  $T(n) = 2 T(n/2) + n \lg n$
25.  $T(n) = 3 T(\sqrt{n}) + \lg n$
26. Define heap. What is max-heap and min-heap property.
27. Show that an  $n$ -element heap has height  $\lg n$ .
28. What are the minimum and maximum number of elements in a heap of height  $h$ ?
29. Is the array with values  $\langle 23, 17, 14, 6, 13, 10, 1, 5, 7, 12 \rangle$  a max heap?
30. Illustrate the operation of MAX-HEAPIFY( $A, 3$ ) on the Array  $A = \langle 27, 17, 3, 16, 13, 10, 1, 5, 7, 12, 4, 8, 9, 0 \rangle$ . Write the pseudocode for MAX-HEAPIFY( $A, i$ ).
31. Show that the worst case running time of MAX-HEAPIFY on a heap of size  $n$  is  $\Omega(\lg n)$ .
32. Illustrate the operation of BUILD-MAX-HEAP on the array  $A = \langle 5, 3, 17, 10, 84, 19, 6, 22, 9 \rangle$
33. Illustrate the operation of HEAPSORT on the array  $A = \langle 5, 13, 2, 25, 7, 17, 20, 8, 4 \rangle$ .
34. What is the running time of HEAPSORT on an array  $A$  of length  $n$  that is already sorted in increasing order? What about decreasing order?
35. Show that the worst-case running time of HEAPSORT is  $\Omega(n \lg n)$ .
36. Write the pseudocode for Quicksort and analyze its running time complexity.
37. Illustrate the operation of PARTITION on the array  $A = \langle 13, 19, 9, 5, 12, 8, 7, 4, 21, 2, 6, 11 \rangle$
38. Write the pseudocode for counting sort and analyze its running time.
39. Prove that counting sort is stable.
40. Prove that the lower bound for comparison based sorting is  $\Omega(n \lg n)$ .
41. Show that the second smallest of  $n$  elements can be found with  $n + \lg n - 2$  comparisons in the worst case.

42. Prove that the lower bound of  $(3n/2) - 2$  comparisons in the worst case to find both the maximum and minimum element of  $n$  numbers.
43. Describe an  $O(n)$  algorithm that, given a set  $S$  of  $n$  distinct numbers and a positive integer  $k \leq n$ , determines the  $k$  numbers in  $S$  that are closest to the median of  $S$ .
44. Define binary search tree along with its property.
45. Write pseudocodes for inorder, preorder and postorder tree walk.
46. For the set of  $\{1,4,5,10,16,17,21\}$  of keys, draw binary search trees of heights 2, 3,4,5 and 6.
47. Write the pseudocode for searching a key in binary search tree.
48. Write the pseudocode for finding minimum and maximum element in a binary search tree.
49. Write the pseudocode for finding successor of an element  $x$  in a binary search tree.
50. Write the pseudocode for finding predecessor of an element  $x$  in a binary search tree.
51. Show that if a node in a binary search tree has two children, then its successor has no left child and its predecessor has no right child.
52. Write the pseudocode for inserting an element  $x$  in a binary search tree.
53. Write the pseudocode for deleting an element  $x$  from a binary search tree.
54. Define red-black tree along with its red-black properties.
55. Show that a red-black tree with  $n$  internal nodes has height at most  $2 \lg(n+1)$ .
56. Write the pseudocode for LEFT-ROTATE( $T,x$ ).
57. Write the pseudocode for RIGHT-ROTATE( $T,x$ ).
58. Show that in every  $n$ -node binary search tree, there are exactly  $n-1$  possible rotations.
59. What is amortized analysis? Mention different methods for amortized analysis.
60. Suppose we perform a sequence of  $n$  operations on a data structure in which the  $i$ th operation costs  $i$  if  $i$  is an exact power of 2, and 1 otherwise. Use aggregate analysis to determine the amortized cost per operation.
61. Suppose we perform a sequence of stack operations on a stack whose size never exceeds  $k$ . After every  $k$  operations, we make a copy of the entire stack for backup purpose. Show that the cost of  $n$  stack operations, including copying the stack is  $O(n)$  by assigning suitable amortized costs to various stack operations.
62. Design and analyze a dynamic programming algorithm for the problem of finding a longest increasing subsequence of a given sequence of  $n$  integers.
63. Design and analyze a dynamic programming algorithm for the 0 – 1 knapsack problem.
64. Design and analyze a dynamic programming algorithm for matrix chain multiplication
65. Define MST, cut, light edge.
66. Show that if an edge  $(u,v)$  is contained in some MST, then it is a light edge crossing some cut of the graph.
67. Show that a graph has a unique minimum spanning tree if, for every cut of the graph, there is a unique light edge crossing the cut.
68. Given a graph  $G$  and a MST  $T$ . Suppose that we decrease the weight of one of the edges not in  $T$ . Give an algorithm for finding the MST in the modified graph.
69. Write pseudocode for Prim's algorithm and analyze its running time.
70. Write Dijkstra algorithm and analyze its running time,.
71. Define P, PSPACE, NP, NP-Complete and NP-Hard.
72. Prove that 3-SAT is NP-Complete.
73. Prove that clique is NP-Complete.
74. Prove that vertex cover is NP-Complete.
75. Prove that independent set is NP-Complete.
76. Prove that Hamiltonian cycle problem is NP-Complete.

**+3 3<sup>RD</sup> YEAR 6<sup>TH</sup> SEMESTER**  
**PAPER – DSE -III**  
**DATA SCIENCE**

1. What is Data Science?
2. Differentiate between Data Analytics and Data Science
3. What do you understand about linear regression?
4. What do you understand by logistic regression?
5. What is a confusion matrix?
6. What do you understand about the true-positive rate and false-positive rate?
7. How is Data Science different from traditional application programming?
8. Explain the differences between supervised and unsupervised learning.
9. What is the difference between the long format data and wide format data?
10. Mention some techniques used for sampling. What is the main advantage of sampling?
11. What is bias in Data Science?
12. What is dimensionality reduction?
13. Why is Python used for Data Cleaning in DS?
14. Why is R used in Data Visualization?
15. What are the popular libraries used in Data Science?
16. What is variance in Data Science?
17. What is pruning in a decision tree algorithm?
18. What is entropy in a decision tree algorithm?
19. What information is gained in a decision tree algorithm?
20. What is k-fold cross-validation?
21. Explain how a recommender system works.
22. What is a normal distribution?
23. What is Deep Learning?
24. What is an RNN (recurrent neural network)?
25. Explain selection bias.
26. What is the ROC curve?
27. What do you understand by a decision tree?
28. What do you understand by a random forest model?
29. How is Data modeling different from Database design
30. What is precision?
31. What is a recall?
32. What is the F1 score and how to calculate it?
33. What is a p-value?
34. Why do we use p-value?
35. What is the difference between an error and a residual error?
36. Why do we use the summary function?
37. How are Data Science and Machine Learning related to each other?
38. Explain univariate, bivariate, and multivariate analyse
39. How can we handle missing data?
40. What is the benefit of dimensionality reduction
41. What is a bias-variance trade-off in Data Science?
42. What is RMSE?
43. What is a kernel function in SVM?
44. How can we select an appropriate value of k in k-means?
45. How can we deal with outliers?
46. How to calculate the accuracy of a binary classification algorithm using its confusion matrix?
47. What is ensemble learning?

48. Explain collaborative filtering in recommender systems
49. Explain content-based filtering in recommender systems.
50. Explain bagging in Data Science.
51. Explain boosting in Data Science.
52. Explain stacking in Data Science.
53. Explain how Machine Learning is different from Deep Learning.
54. What does the word 'Naive' mean in Naive Bayes?
55. Please explain the goal of A/B Testing.
56. How will you calculate the Sensitivity of machine learning models?
57. Could you draw a comparison between overfitting and underfitting
58. Between Python and R, which one would you pick for text analytics, and why?
59. Please explain the role of data cleaning in data analysis.
60. What do you mean by cluster sampling and systematic sampling?
61. Please explain Eigenvectors and Eigenvalues.
62. Can you compare the validation set with the test set?
63. What do you understand by linear regression and logistic regression?
64. Please explain Recommender Systems along with an application.
65. What are outlier values and how do you treat them?
66. Please enumerate the various steps involved in an analytics project.
67. Could you explain how to define the number of clusters in a clustering algorithm?
68. What do you understand by Deep Learning?
69. Please explain Gradient Descent.
70. How does Backpropagation work? Also, it states its various variants.
71. What do you know about Autoencoders?
72. Please explain the concept of a Boltzmann Machine.
73. What are the skills required as a Data Scientist that could help in using Python for data analysis purposes?
74. What is the full form of GAN? Explain GAN?
75. What are the vital components of GAN?
76. What is the Computational Graph?
77. What are tensors?
78. Why are Tensorflow considered a high priority in learning Data Science?
79. What is Dropout in Data Science?
80. What is Batch normalization in Data Science?
81. What is the difference between Batch and Stochastic Gradient Descent?
82. What are Auto-Encoders?
83. What are the various Machine Learning Libraries and their benefits?
84. What is an Activation function?
85. What are the different types of Deep Learning Frameworks?
86. What are vanishing gradients?
87. What are exploding gradients?
88. What is the full form of LSTM? What is its function?
89. What are the different steps in LSTM?
90. What is Pooling on CNN?
91. What is RNN?
92. What are the different layers on CNN?
93. What is an Epoch in Data Science?
94. What is a Batch in Data Science?
95. What is the iteration in Data Science? Give an example?
96. What is the cost function?

97. What are hyperparameters?
98. Which skills are important to become a certified Data Scientist?
99. What is an Artificial Neural Network in Data Science?
100. What is Deep Learning in Data Science?
101. Are there differences between Deep Learning and Machine Learning?
102. What is Ensemble learning?
103. What are the different kinds of Ensemble learning?