



Subject: Data Structures using C

Subject Code

: 18CSI301

Semester: III

Credits

: 03

Question Bank

UNIT 1

1. What is data structure? Explain the classification of data structure.
2. Explain the memory representation of 1D and 2D arrays with examples.
3. With a suitable example, explain i) self-referential structures ii) nested structures
4. Write a C program with an appropriate structure definition and variable declaration to read and display information about an employee using nested structures. Consider the following fields: Ename, Eid, DOJ(Date, Month, Year) and Salary(Basic, DA, HRA).
5. Write a brief note on the following,
 - a. Arrays
 - b. Structures
 - c. Unions
6. Discuss briefly about Data Structure Operations with a suitable example.
7. Compare and contrast structures and unions with suitable examples.
8. Mention the applications of arrays.
9. How is a Pointer Declared & Initialized? Explain with an example C Program.
10. Write a short note on Dynamic Memory Allocation(DMA).
11. With suitable examples, discuss the different dynamic memory allocation functions used in C.
12. Write the differences between malloc() and calloc() with examples.
13. Write C functions to perform the following string operations using pointers:
 - a) To concatenate two strings: (S1=Data; S2=Structures)
 - b) To reverse a string: S2
 - c) To copy string S1 to string S2.
 - d) To compare two strings
14. Briefly explain about Static Memory Allocation & Dynamic Memory Allocation. Mention few differences between them.

15. List out the operations that can be performed on a string.
16. Write a short note on pattern matching algorithm.
17. Explain linear search and write an algorithm/program to perform it.
18. Explain binary search and write an algorithm/program to perform it.
19. Consider $a[] = \{5, 10, 15, 20, 25, 30, 35, 40\}$. Search an element 35 using binary search.
20. Explain in detail the pattern matching algorithms. Discuss the brute force pattern matching algorithm. Also solve it for the following pattern Pattern="CAT" ; TEXT="ABABNACATM"
21. Consider an array of elements $arr[6] = \{23, 78, 45, 8, 32, 56\}$, sort the following elements in ascending order using insertion sort. Write pseudo code / algorithm.
22. Consider an array of elements $arr[] = \{50, 34, 21, 67, 5, 78, 98\}$, sort the following elements in ascending order using insertion sort. Write pseudo code / algorithm.
23. Consider an array of elements $\{247, 321, 515, 227, 642, 413, 109, 248, 754, 930\}$ Arrange the given numbers using radix sort.
24. Consider an array of elements $\{24, 21, 500, 270, 642, 43, 109, 28, 54, 93, 99\}$ Arrange the given numbers using radix sort.

UNIT 2

1. Write a brief note on Stack data structure.
2. Outline the operations that can be performed on stack data structure.
3. Discuss the disadvantages of linear queue. Illustrate the implementation of circular queue using C programming.
4. List the applications of stack.
5. Convert the following infix expressions to its equivalent postfix expressions using stack.
 - i) $(A + (B - C) * D)$
 - ii) $(A + B) * (D - C)$
 - iii) $(A + B) * (C - D) / E$
 - iv) $A + (B * C - (D / E \wedge F))$
 - v) $2 * 3 / (2 - 1) + 5 * 3$
 - vi) $12 / 3 * 6 + 6 - 6 + 8 / 2$
6. Evaluate the following postfix expressions using stack.
 - i) $A B + C - B A + C * -$
 - ii) $A B C + * C B A - + *$ (where $A=1, B=2, C=3$)
 - iii) $6 3 2 - 5 * + 1 / 7 +$
 - iv) $5 3 + 8 2 - *$
 - v) $2 3 1 * + 9 -$

- vi) $5 \ 3 \ 2 \ + \ 8 \ * \ +$
7. Convert the following infix notation to postfix notation
 $a / b - c + d * e - a * c$
 $((a + b) / d - ((e - f) + g))$
- i) trace that postfix expression for given data $a = 6, b = 3, c = 1, d = 2, e = 4, f = 5, g = 7$
- ii) convert the obtained postfix notation to infix notation.
8. Write recursive program:
- To find the sum of first N natural numbers.
 - To find the factorial of a number
 - To find the Nth term of a Fibonacci series.
 - To generate N terms of a Fibonacci series.
 - To find the GCD of two numbers.
9. Illustrate the concept of Tower of Hanoi for $n=1, n=2, n=3$ where 'n' indicates the no of disks. Write pseudo code for Tower of Hanoi using recursion.
10. Write an algorithm/program to convert infix expression to its equivalent postfix expression with suitable example.
11. Write an algorithm/program to evaluate postfix expression using stacks.
12. Write a short note on Queues.
13. Distinguish between stacks and Queues.
14. Explain the algorithm to implement a circular queue with suitable example.
15. Represent the following sparse matrix using arrays and linked list. Also find its transpose.

$$\begin{pmatrix} 15 & 0 & 0 & 22 & 0 & -5 \\ 0 & 10 & 2 & 0 & 0 & 0 \\ 0 & 0 & 0 & -4 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 91 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 28 & 0 & 0 & 0 \end{pmatrix}$$

16. Write an algorithm/program to perform enqueue and dequeue in Queue.
17. Write a C program to represent a sparse using arrays.
18. Write C functions to perform the following operations on a double ended queue.
- Front insertion
 - Rear insertion
 - Front deletion
 - Front insertion
19. Discuss priority queue and types of priority queues.



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20. Explain the applications of queues.
