



K.S. SCHOOL OF ENGINEERING AND MANAGEMENT, BENGALURU-560109
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SESSION: 2022-2023 (ODD SEMESTER)
DATA STRUCTURES AND APPLICATIONS (21CS32)

Question bank-1

Module-1

1. **Define** data structures. With a neat diagram, **explain** the different classifications of Data structures.
2. **Define** structure. **How** it is represented in C language. Give an example program using structures.
3. **Differentiate** structure and union.
4. **What** are self-referential structures? Give one example.
5. **Define** nested structure. **Give** 2 ways of declaring nested structure with example program.
6. **Define** Array. **Explain** with program, the operations performed on array.
7. **Develop** C programs to perform each of the following (i) linear search (ii) binary search (iii) bubble sort taking a array of 'n' integers.
8. Which are the 4 inbuilt functions to perform dynamic memory allocation. Discuss the importance of Dynamic memory allocation. Write a C program to create an array dynamically.
9. **Develop** a C function to create 2d array dynamically. Use MALLOC macro.
10. **Illustrate** with an example how sparse matrix is efficiently stored in triple format. Write its C representation.
11. Write an ADT of Polynomial.
12. Write an ADT of Sparse Matrix
13. **Define** String. Write a C program to perform pattern matching.
14. Write a function to perform polynomial addition.
15. **Find** the table and corresponding graph for the second pattern matching algorithm where the Pattern is ababab

Module-2

16. **Define** Stack. List the operations performed on Stack.
17. **Develop** an algorithm to convert infix expression to postfix expression.
18. Convert the following expression to postfix using stack $(a+b)*((b^c)*f)/g$
19. **Define** Recursion. **Illustrate** with an example how stack is used in recursion.
20. **Define** Recursion and **Evaluate** $A(1,3)$ using Ackermann's function.

21. Write an algorithm for Evaluation of postfix expression.
22. Write a C function to evaluate postfix expression.
23. Write a Recursive C program for each of the following:
 - (i) Tower of Hanoi
 - (ii) Computing GCD of two numbers.
 - (iii) Fibonacci series
 - (iv) To compute factorial of N.

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Question bank-2

Module-2 (Queues)

1. Define Queue. Implement the operations of the queue using arrays. Apply the same on job scheduling.
2. Show how queues are represented using arrays?
3. Explain queues operations using dynamic arrays.
4. Give the disadvantage of the ordinary queue and how it is solved in a circular queue. Explain with a suitable example of how you would implement a circular queue using a dynamically allocated array.
5. What is a circular queue? Explain how it is different from the linear queue.

Module-3 (Linked List)

1. Describe doubly linked list with advantages and disadvantages. Write a C function to delete a node from a doubly linked list. Ptr is the pointer which points to the node to be deleted.
2. Define linked list. Write the representation of linked lists in memory.
3. How the nodes are represented using C?
4. Explain linked list operation with examples.
5. What is doubly linked list. Write the declaration of doubly linked list in C.
6. With the C program explain how the elements are inserted and deleted from a doubly linked list
7. Write a note on a header linked list.
8. Briefly explain linked stack and queue.
9. Apply a linked list to represent two polynomials and write a function to add the polynomials using the linked list.

10. List out any two applications of the linked list and any two advantages of doubly linked list over the singly linked list.
11. Write a short note on circular lists. Write a function to insert a node at the front and rear end in a circular linked list. Write down the sequence of steps to be followed.
12. Write the following functions for singly linked list: i) Reverse the list ii) Concatenate two lists.
13. What is a linked list? Explain the different types of linked lists with a diagram. Write C program to implement the insert and delete operation on a queue using a linked list.
14. Explain the sparse matrix using Linked list. Write a node structure for linked representation and apply it for the following Matrix

$$A = \begin{pmatrix} 10 & 25 & 0 & 0 & 0 \\ 0 & 23 & 0 & 45 & 0 \\ 0 & 0 & 0 & 0 & 32 \\ 42 & 0 & 0 & 31 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 30 & 0 & 0 \end{pmatrix}$$



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FIRST ASSIGNMENT

Degree : B.E
Branch : CSE
Course Title : Data Structures and Applications
Date : 26/11/2022

Semester : III
Course Code : 21CS32
Max Marks : 10
Last Date : 02/12/2022
for submission

Q No.	Questions	Marks	K-Level	CO mapping
1	a) Define Data structures. Give its classification and explain in brief. What are the basic operations that can be performed on Data structure? b) Illustrate the dynamic memory allocation functions in detail with example. Differentiate between malloc() and calloc() functions.	1	Applying K3	CO1
2	a) Define an array? Explain various operations performed on array with example. b) Develop an algorithm for Bubble sort and Apply for the following Data 40,3,20,35,50,31,5,6	1	Applying K3	CO1
3	a) Define pointers? How to declare and initialize pointer? What is dangling reference? Explain why pointers can be dangerous. b) Differentiate between Structure and Union with suitable example and Explain self-referential structure.	1	Understanding K2	CO1
4	Assume each student in a class of 25 students is given 4 test . Assume the students are numbered from 1 to 25 and the test scores are assigned in the 25*4 matrix called score. Assume base of score=200 ,W=4 and the programming language uses row major order and column major order to store this 2D array then find the address of 3rd test of 12th student (i.e)score[13,3] in both row major order and column major order .	1	Applying K3	CO1
5	a) Define the 2 ways to represent polynomial in C and Show the structural representation for the given 2 polynomials, $A(x)=4x^{15}+3x^4+5$ and $B(x)=2x^{1000}+10$. Develop a function to add 2 polynomials. b) Explain ADT of the polynomial.	1	Applying K3	CO1
6	a) Explain ADT of sparse matrix. b) Write the Fast transpose algorithm of Sparse Matrix. Identify the triplet form of Sparse matrix and identify the transpose of the given Matrix	1	Applying K3	CO1

	<p>a) $\begin{pmatrix} 10 & 0 & 0 & 25 & 0 \\ 0 & 23 & 0 & 0 & 45 \\ 0 & 0 & 0 & 0 & 32 \\ 42 & 0 & 0 & 31 & 0 \\ 0 & 0 & 32 & 0 & 0 \end{pmatrix}$</p> <p>b) $\begin{pmatrix} 0 & 10 & 0 & 20 & 0 \\ 30 & 0 & 0 & 0 & 40 \\ 0 & 50 & 0 & 0 & 0 \\ 0 & 0 & 60 & 0 & 0 \end{pmatrix}$</p>			
7	<p>Develop an algorithm for Evaluation of Postfix expression and apply it for the following data</p> <p>a) $23^{\wedge}522^{\wedge}+126/-$ b) $12+3-21+3^{\wedge}+$</p>	1	Applying K3	CO1
8	<p>Develop the algorithm of first Pattern matching Algorithm and Knuth Morris Pratt Pattern Matching Algorithm and Apply both on the following Data</p> <p>a) $T=abcaabaaabcaabbc$ $P1=aaabb$ and $P2=aaa$</p>	1	Applying K3	CO2
9	<p>Develop an algorithm for converting Infix to Postfix Evaluation. Evaluate the following expressions</p> <p>a) $A+(B*C-(D/E^{\wedge}F)*G)*H$ b) $a/b-c+d*e+a*c$</p>	1	Applying K3	CO2
10	<p>a) Develop a c program to demonstrate various stack operations, including cases for overflow and underflow of STACK.</p> <p>b) Define Recursion. What are the properties of recursive procedure? Develop a recursive procedure for i) Tower of Hanoi ii) Factorial of a number</p>	1	Applying K3	CO2

Kavitha
Course In charge

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HOD
30/11/22