

CBCS SCHEME

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18CS32

Third Semester B.E. Degree Examination, Dec.2024/Jan.2025 Data Structures and Applications

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Illustrate the difference between linear and non – linear data structure with an example. (04 Marks)
- b. Write the functions to compare and concatenate strings. What are the equivalent library functions? (08 Marks)
- c. Illustrate with a diagram 2 – d array of 3 – rows and 4 – columns in row major order. Write a function to print row and column index of a given number N. (08 Marks)

OR

- 2 a. Write the type definition for an element as triplets in a sparse matrix. What is the advantage? (04 Marks)
- b. With a diagram, illustrate representation of the polynomial $A(x) = a_0 + a_1x^1 + a_2x^2 + \dots + a_nx^n$. Write a program to construct the polynomial. (08 Marks)
- c. Implement C - program to match all occurrence of pattern 'P' in text 'T'. (08 Marks)

Module-2

- 3 a. Write a recursive function to compute gcd of two numbers. (04 Marks)
- b. Write a program to implement the stack operations using dynamic array. (08 Marks)
- c. Convert $a * x^2 + b * x + C$ into post fix expression using stack. (08 Marks)

OR

- 4 a. Write a recursive function for Ackermann function $A(m, n)$.
$$A(m, n) = \begin{cases} n+1 & \text{if } m=0 \\ A(m-1, 1) & \text{if } m \neq 0 \text{ but } n=0 \\ A(m-1, A(m, n-1)) & \text{if } m \neq 0 \text{ \& } n \neq 0 \end{cases}$$
 (04 Marks)
- b. Write a program to implement queue operations for the circular queue. (08 Marks)
- c. Evaluate postfix expression $ab + cd + * 2 /$, when $a = b = c$ and $c = d = 4$ using stack. (08 Marks)

Module-3

- 5 a. Describe the dynamic memory allocation and free functions. (04 Marks)
- b. Write a program to create linked list for the polynomial $1 + 2x + 3x^2 + \dots + nx^{n-1}$. (08 Marks)
- c. Write a program to implement stack operations using linked list. (08 Marks)

OR

- 6 a. Define self referential structure for integer data and allocate the memory required by the structure. (04 Marks)
- b. Given a linked list of characters (data field) 'A', 'B' and 'C'. Write a function to
 i) insert 'X' between 'A' and 'B' ii) Delete 'B' from the list. (08 Marks)
- c. Write a program to implement queue operations using linked list. (08 Marks)

Module-4

- 7 a. What is Binary Search Tree (BST)? Define structure of a node in BST in 'C'. (04 Marks)
- b. Draw an expression tree for $((a + (b * ((c - d) / e))) + f)$. (08 Marks)
- c. Write a function to insert an item into a binary search tree without duplications. (08 Marks)

OR

- 8 a. Explain strictly binary tree and complete binary tree with examples for each. (04 Marks)
- b. Given pre – order sequence 1, 2, 4, 3, 5, 7, 8, 6 and inorder sequence 4, 2, 1, 7, 5, 8, 3, 6. Construct a corresponding BST. (08 Marks)
- c. Illustrate depth of the tree with an example. Write a function to find the depth of the tree. (08 Marks)

Module-5

- 9 a. With an example, describe two representations of the graph. (04 Marks)
- b. Explain graph traversal methods. Write a program for depth first search. (08 Marks)
- c. Describe the types, attributes and operations. (08 Marks)

OR

- 10 a. Describe hash table including collision and overflows. (04 Marks)
- b. Write an algorithm for insertion sort. Apply insertion sort showing various passes to sort the array $A = [2, 1, 6, 5, 4, 3]$. (08 Marks)
- c. What is a file? Describe sequential and index sequential file organizations. (08 Marks)

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