Professional Course (Odd) Examination, 2025

(3rd Semester)

BACHELOR OF COMPUTER APPLICATIONS

(Data Structure using C)

Full Marks : 75

Time : 3 hours

The figures in the margin indicate full marks for the questions

(PART : A—OBJECTIVE)

(*Marks* : 25)

SECTION—I

(*Marks* : 15)

I. Tick (✓) the correct answer in the brackets provided : 1×10=10

1. The amount of time, an algorithm takes to complete its execution, is

(a) time complexity ( )

(b) turnaround time ( )

(c) time period ( )

(d) cycle time ( )

2. A pointer variable is declared using preceding _____ sign.

(a) % ( )

(b) & ( )

(c) * ( )

(d) ^ ( )

3. In a stack, if a user tries to remove an element from an empty stack, is called

(a) crash ( )

(b) underflow ( )

(c) empty ( )

(d) garbage collection ( )

4. Which of the following data structures allows insertion and deletion from both ends?

(a) Queue ( )

(b) Stack ( )

(c) Deque ( )

(d) String ( )

5. What is the time complexity of the binary search algorithm?

(a) $O(n)$ ( )

(b) $O(n^2)$ ( )

(c) $O(\log n)$ ( )

(d) $O(\log 2n)$ ( )

6. A sort which compares adjacent elements in a list and switches where necessary is

(a) merge sort ( )

(b) bubble sort ( )

(c) insertion sort ( )

(d) quicksort ( )

7. The type of linked list in which none of the nodes contains a null pointer is

(a) singly linked list ( )

(b) doubly linked list ( )

(c) circular linked list ( )

(d) double-ended linked list ( )

8. A doubly linked list has

(a) 2 fields ( )

(b) 3 fields ( )

(c) 4 fields ( )

(d) null ( )

9. The number of edges for a tree with n vertices is

(a) $n-1$ ( )

(b) $n+1$ ( )

(c) $(n-1)/2$ ( )

(d) $(n+1)/2$ ( )

10. The pre-order traversal has a sequence

(a) left—right—root ( )

(b) left—root—right ( )

(c) root—right—left ( )

(d) root—left—right ( )

II. State whether the following statements are *True (T)* or *False (F)* by putting a Tick (✓) mark in the brackets provided : 1×5=5

1. Array is a collection of elements of the same data type stored sequentially in memory location.

(T / F)

2. A queue is linear data structure that follows the LIFO principle.

(T / F)

3. Quicksort and merge sort are the examples of divide and conquer algorithm.

(T / F)

4. A circular linked list's last node points to null.

(T / F)

5. A full binary tree is a binary tree in which node has either zero or two children.

(T / F)

SECTION—II

(*Marks* : 10)

III. Answer the following questions : 2×5=10

1. Define abstract data type. Give one example.

2. What is the postfix expression of $a + (b * c(d / e \wedge f) * g) * h$?

3. What are the advantages of binary search over linear search?

4. What is the significance of null pointer in a linked list?

5. What do you mean by traversing a tree?

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

IV. Answer the following questions : 10×5=50

1. *(a)* What is a pointer? How do you declare and initialize a pointer? Write a C program to declare and initialize a pointer. 6

   (b) Explain the four dynamic memory allocation functions. 4

OR

2. Define a data structure. Explain the different operations of data structure. 10

3. What is stack? Explain PUSH and POP operations of stack. Write the C function code to perform PUSH and POP operations. 10

OR

4. *(a)* Explain the operation of circular queue with a C program. 6

(b) What is deque? How does it differ from linear queue? 4

5. *(a)* Write a C program for sorting an array using selection sort. 4

(b) Write a C program for the implementation of binary search technique. 6

OR

6. *(a)* Write a C program for the implementation of linear search technique. 4

(b) Write a C program for sorting an array using quicksort. 6

7. Define linked list. What are the advantages of a linked list? Write a C function code for inserting and deleting a node at the beginning of a singly linked list. 10

OR

8. *(a)* Differentiate between doubly linked list and circular linked list. 4

(b) Write a C function code for creating and displaying nodes of a circular linked list. 6

9. *(a)* What is a tree? Explain by giving example. 4

(b) What is a binary tree? Explain different types of binary tree. 6

OR

10. *(a)* What are DFS and BFS of a graph? Explain with a diagram. 4

(b) Construct a binary tree from the given pre-order and in-order sequences : 6

In-order : *D, B, E, A, F, C*

Pre-order : *A, B, D, E, C, F*

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