Professional Course (Odd) Examination, 2024

(CBCS)

(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)

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

1. How is the 2nd element in an array accessed based on pointer notation?

   (a) $*a+2$ ( ) *(b)* $*(a+2)$ ( )

   (c) $*(*a+2)$ ( ) *(d)* & $(a+2)$ ( )

2. Which of the following is a linear data structure?

   (a) Graphs ( ) *(b)* Array ( )

   (c) Binary tree ( ) *(d)* AVL Tree ( )

3. Which of the following is not the type of queue?

(a) Priority queue ( ) (b) Single-ended queue ( )

(c) Circular queue ( ) (d) Ordinary queue ( )

4. Which of the following data structures finds its use in recursion?

(a) Arrays ( ) (b) Linked list ( )

(c) Queues ( ) (d) Stacks ( )

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

(a) O (n) ( ) (b) O (1) ( )

(c) O (log 2n) ( ) (d) O (n^2) ( )

6. Which of the following sorting algorithms provides the best time complexity in the worst-case scenario?

(a) Merge sort ( )

(b) Insertion sort ( )

(c) Selection sort ( )

(d) Quick sort ( )

7. Which of the following can be done with linked list?

(a) Implementation of stack and queue ( )

(b) Implementation of Binary tree ( )

(c) Implementation of data structure that can simulate dynamic arrays ( )

(d) All of the above ( )

8. In linked list implementation of a queue, where should a new element be inserted?

(a) At the head of linked list ( )

(b) At the center position in the linked list ( )

(c) At the tail of the linked list ( )

(d) At any position in the linked list ( )

9. The post-order traversal has a sequence

(a) left-right-root ( ) (b) left-right-left ( )

(c) left-root-right ( ) (d) right-root-left ( )

10. What is the maximum number of children a node can have in an n-ary tree?

(a) n ( ) (b) 0 ( )

(c) 1 ( ) (d) 2 ( )

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

1. The malloc() function initializes allocated memory to zero.

(T / F)

2. Recursive algorithms are implemented using while loop.

(T / F)

3. The number of key comparisons in a sequence search depends on the value of the search item.

(T / F)

4. A linked list is a random-access data structure such as an array.

(T / F)

5. Trees can be empty.

(T / F)

SECTION—II

(*Marks* : 10)

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

1. What are non-linear data structures? Give examples.
2. What is recursive function? Explain in brief.
3. Which of the sorting techniques is fastest? Why?
4. How is linked list efficient in terms of memory over an array?
5. Mention the applications of trees.

(PART : B—DESCRIPTIVE)

(*Marks* : 50)

1. *(a)* What is dynamic memory allocation? Explain the four dynamic memory allocation functions with their syntax. 2+8=1

OR

(b) What are the different operations of data structure?

(c) Write an illustration to understand the pointer of array.

2. *(a)* Find the prefix and postfix of the following :

$$A + (B / C - (D^*E\hat{}F) + G)^*H$$

(b) By mentioning every step, evaluate the following postfix expression :

$$74 - 3^*15 + /^*$$

OR

(c) Explain the working principle of stack with appropriate diagram. Explain its operations with an algorithm.

(d) What are the applications of queues?

3. *(a)* Write a C program to implement a binary search. Explain the concept and working principles of Binary search with appropriate examples. 6+4=1

OR

(b) Explain in detail how a selection and merge sort work for the following data :

32, 16, 4, 11, 38, 7

(c) Write a C program of bubble sort.

4. *(a)* What are the different types of linked list? Explain any four with appropriate diagram. Mention two advantages and two disadvantages of each linked list. 10

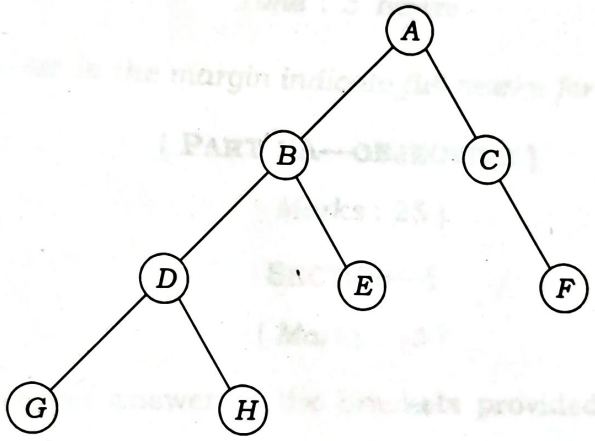
OR

(b) Write a C program to implement a circular linked list that inserts at any given position, deletes and displays items. 10

5. *(a)* From the following numbers, form the binary search tree : 4

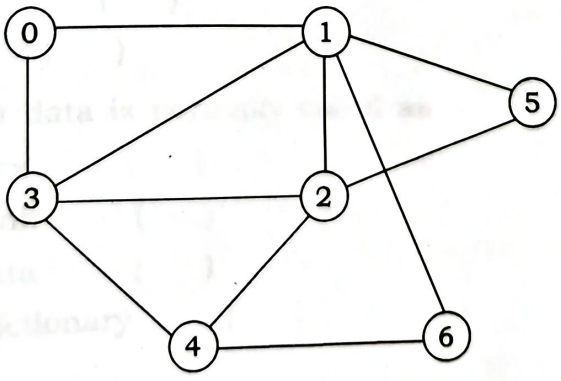
45, 34, 18, 90, 23, 68, 45, 9

(b) From the following binary tree, write down the in-order, pre-order and the post-order traversals : 6



OR

(c) Explain DFS and BFS using the following graph, starting from the node 0. Mention two differences of DFS and BFS : 4+4+2=10



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