

2023

COMPUTER SCIENCE

Paper : CSTHC3056

(Data Structure)

(Theory)

Full Marks : 60

Pass Marks : 24

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

- 1. Choose the correct option from the following
(any five) :** **1×5=5**

(a) What is a data structure?

- (i) A programming language**
- (ii) A collection of algorithms**
- (iii) A way to store and organize data**
- (iv) A type of computer hardware**

(2)

(b) Which data structure is used for implementing recursion?

(i) Stack

(ii) Queue

(iii) List

(iv) Array

(c) The prefix form of $A - B / (C * D \wedge E)$ is

(i) $-A / B * C \wedge DE$

(ii) $-A / BC * \wedge DE$

(iii) $-ABCD * \wedge DE$

(iv) $- / * \wedge ACBDE$

(d) Which of the following is a linear data structure?

(i) Array

(ii) AVL tree

(iii) Binary tree

(iv) Graph

(3)

(e) When a pop() operation is called on an empty queue, what is the condition called?

(i) Overflow

(ii) Underflow

(iii) Syntax error

(iv) Garbage value

(f) Which of the following data structures allows insertion and deletion from both ends?

(i) Stack

(ii) Deque

(iii) Queue

(iv) String

(g) Which of the following is a divide-and-conquer algorithm?

(i) Bubble sort

(ii) Selection sort

(iii) Heap sort

(iv) Merge sort

(4)

(h) Which of the following represents the post-order traversal of a binary tree?

- (i) Left -> Right -> Root
- (ii) Left -> Root -> Right
- (iii) Right -> Left -> Root
- (iv) Right -> Root -> Left

(i) Which data structure is needed to convert infix notation to postfix notation?

- (i) Tree
- (ii) Branch
- (iii) Stack
- (iv) Queue

(j) Which of the following is not the type of queue?

- (i) Priority queue
- (ii) Circular queue
- (iii) Single-ended queue
- (iv) Ordinary queue

(5)

2. Answer any *five* of the following questions :

2×5=10

- (a) What are sparse matrices?
- (b) Explain the terms 'stack overflow' and 'stack underflow'.
- (c) What is polish notation? Give one example.
- (d) How does doubly linked list differ from circular linked list?
- (e) What is a last-in-first-out (LIFO) data structure?
- (f) How does a queue in data structure work?
- (g) Name two collision handling techniques in data structure.

3. Answer any *five* of the following questions :

5×5=25

- (a) Explain the difference between linear data structure and non-linear data structure.
- (b) Explain threaded binary tree with necessary diagram.
- (c) What is the disadvantage of 'list using array' over linked list implementation of a list?

(2)

(b) Which data structure is used for implementing recursion?

(i) Stack

(ii) Queue

(iii) List

(iv) Array

(c) The prefix form of $A - B / (C * D \wedge E)$ is

(i) $-A / B * C \wedge DE$

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(f) Which of the following data structures allows insertion and deletion from both ends?

(i) Stack

(ii) Deque

(iii) Queue

(iv) String

(g) Which of the following is a divide-and-conquer algorithm?

(i) Bubble sort

(ii) Selection sort

(iii) Heap sort

(iv) Merge sort

(d) Compare any two sorting techniques in terms of time and space complexities.

(e) What are the advantages of hashing in data structure?

(f) Explain the working of a priority queue.

(g) What are the limitations in the array representation of a stack?

(h) What is the pre-requisite for binary search technique? Explain binary search technique with one example program.

(i) What is an AVL tree? Give example with diagram.

4. Answer any two of the following questions :
 $10 \times 2 = 20$

(a) What is recursion? Distinguish between recursive functions and non-recursive functions with suitable example.

(b) Explain with example programs, the working of circular linked list. Also, explain its advantage over singly linked list.

(c) What is a binary search tree? Draw a binary search tree considering some integers. Explain the pre-order, in-order and post-order traversals on this binary search tree.

(d) Explain the following policies of data structure :
 $2 \times 5 = 10$

(i) LIFO

(ii) FILO

(iii) LILO

(iv) FIFO

(v) PUSH-POP
