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**B. Tech. III - Sem. (Main) Exam., (Academic Session 2021- 2022)**

**Computer Science and Engineering**

**3CS4 – 05 Data Structures and Algorithms**

**Common with a CSE/IT/AI/DS/MLC/AI&DS/AI&ML/CSE (DS)/CSE  
(AI &ML)/CSE (AI)**

**Time: 2½ Hours**

**Maximum Marks: 120  
Min. Passing Marks:**

**Instructions to Candidates:**

**Part – A:** Short answer questions (up to 25 words)  $6 \times 3$  marks = 18 marks.  
Candidates have to answer **six** questions out of **ten**

**Part – B:** Analytical/Problem solving questions  $3 \times 10$  marks = 30 marks.  
Candidates have to answer **three** questions out of **seven**.

**Part – C:** Descriptive/Analytical/Problem Solving questions  $3 \times 24$  marks = 72 marks.  
Candidates have to answer **three** questions out of **five**.

*Schematic diagrams must be shown wherever necessary. Any data you feel missing may suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

*Use of following supporting material is permitted during examination.  
(Mentioned in form No. 205)*

1. NIL

2. NIL

### **PART – A**

~~Q.1~~ Describe the dequeue procedure in queue.

~~Q.2~~ Differentiate linear and non-linear data structure.

Q.3 Explain the use of the top variable and the pop method in stack?

~~Q.4~~ What is Queue? Why is it known as FIFO?

Q.5 Represent the expression  $A+B*(C-D)/(P-R)$  in postfix format?

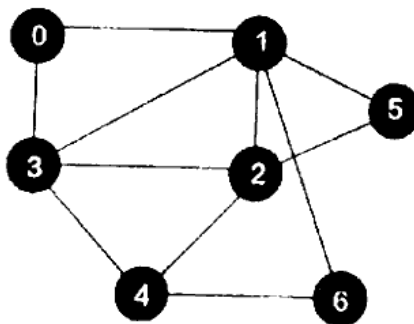
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- Q.6 Define tree-traversal and enumerate different types of traversal methods?
- Q.7 When a singly linked list can be represented as a circular linked list?
- Q.8 Mention at least two applications of priority queues.
- Q.9 When is a graph said to be weakly connected?
- Q.10 What is Spanning Trees?

### PART – B

- Q.1 Write down the function or pseudocode to insert an element in-to a queue which is implemented using an array.
- Q.2 A circle queue has a size of 5 and has 3 elements 10, 20 and 40 where front F=2 and rear R=4. After inserting 50 and 60, what is the value of F and R. Trying to insert 30 at this stage what happens? Delete 2 elements from the queue and insert 70, 80 & 90. Show the sequence of steps with necessary diagrams with the value of F & R at every step.
- Q.3 Explain Breadth First Search traversal using the given graph considering 0 as root node. (Show every step)



- Q.4 Define a heap. How can it be used represent a priority queue?
- Q.5 Sort the following numbers in ascending order using Insertion sort. Given Numbers: 348, 14, 614, 5381, 47 and write the output after each iteration. Create a Singly Linked List using data fields 10, 20, 30, 40, 50. And sketch stepwise procedures from start to end.
- Q.6 Explain Quick Sort with the help of an example.
- Q.7 Write an algorithm for converting Parenthesized Infix expression into Postfix expression.

## PART - C

- Q.1 (a) Create a binary search tree for the following numbers starting from an empty binary search tree. 45, 26, 10, 60, 70, 30, 40
- (b) Delete keys 10, 60 and 45 one after the other and show the trees at each step.

Q.2 Show the effect of PUSH and POP operation on-to the stack of size 10. The stack contains 10, 20, 22, 26, 28 and 30, with 30, being at top of the stack. Show diagrammatically the effect of -

- (a) PUSH 46
- (b) PUSH 48
- (c) POP
- (d) POP
- (e) POP

Sketch the structure of stack after performing each of the above said operations. What is the meaning of height-balanced tree? How rebalancing is done in a height balanced tree.

Q.3 Define an AVL tree. Obtain an AVL tree by inserting one integer at a time in the following sequence. 150, 155, 160, 115, 110, 140, 120, 145, 130, 147, 170, 180. Draw the tree after each step. <https://www.btubikaner.com>

Q.4 Given the input {4371, 1323, 6173, 4199, 4344, 9679, 1989} and a hash function of  $h(X)=X \pmod{10}$  show the resulting:

- (a) Separate Chaining hash table
- (b) Open addressing hash table using linear probing

Q.5 Explain the basic two techniques for collision-resolution in Hashing with example. Also, explain primary clustering.

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