

17092(N)

**B. Tech 3rd Semester Examination**

**Data Structures (CBS)**

**CS-301**

**Time : 3 Hours**

**Max. Marks : 60**

*The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.*

**Note :** Attempt five questions in all selecting one question from the sections A, B, C and D. Section E is compulsory. All questions carry 12 marks.

**SECTION - A**

1. What is a recursive algorithm? Find out the complexity of recursive method of solution of Tower of Hanoi problem. (12)
2. What do you mean by the time and space complexity of an algorithm? Derive the time complexity function for Binary Search. (12)

**SECTION - B**

3. Explain how to implement two stacks in one array  $A[1..n]$  in such a way that stack overflows only when the total number of elements in both stacks together is  $n$ . Write algorithm to PUSH and POP operations also. (12)
4. Write an algorithm to interchange  $m^{\text{th}}$  and  $n^{\text{th}}$  node in a doubly linked list. (12)

**SECTION - C**

5. Derive a recurrence relation for the number of possible binary search trees with  $n$  nodes. (12)

2

17092

6. Explain, with pseudocode, the various rotations to be performed in AVL tree. Show the AVL tree that results after each of the integer keys 9, 27, 50, 15, 2, 21, and 36 are inserted, in that order, into an initially empty AVL tree. Clearly show the rotations that must be performed. (12)

**SECTION - D**

7. Explain Quick sort technique. Also find its average case and worst case complexity. (12)
8. What is collision in Hashing? What are the various techniques to resolve the collision? Discuss the efficiency of each one. (12)

**SECTION - E**

9. Fill in the blanks.
  - (i) If the address of  $A[1][1]$  and  $A[2][1]$  are 1000 and 1010 respectively and each element occupies 2 bytes then the array has been stored in \_\_\_\_\_ order.
  - (ii) 2D array can be used to implement \_\_\_\_\_ queue.
  - (iii) If  $f(n) = \Theta(g(n))$  then  $g(n)$  is an asymptotically \_\_\_\_\_ bound for  $f(n)$ .
  - (iv) The result of evaluating the postfix expression 5, 4, 6, +, \*, 4, 9, 3, /, +, \* is \_\_\_\_\_.
  - (v) A Tower of Hanoi problem with 8 disks performs \_\_\_\_\_ moves.
  - (vi) The recurrence relation capturing the optimal execution time of the Towers of Hanoi problem with  $n$  discs is \_\_\_\_\_.

- (vii) A binary tree is represented using the array given below

A	B	C	D	E	F	G		H	.	.	.	.	I	J	...
---	---	---	---	---	---	---	--	---	---	---	---	---	---	---	-----

The in-order traversal of the tree is \_\_\_\_\_

- (viii) Threaded Binary Tree helps in \_\_\_\_\_ process.
- (ix) If A S P F Y T U Z C is post-order traversal of a tree then \_\_\_\_\_ is the root.
- (x) The complexity of Binary Search is \_\_\_\_\_.
- (xi) The complexity of finding an item using hash function is \_\_\_\_\_.
- (xii) Hash is a kind of \_\_\_\_\_ function. (12×1=12)