[This question paper contains 4 printed pages]

Your Roll No .

6216 **JB**

B.Sc. (H) COMPUTER SCIENCE/ II Sem.

Paper—201 DATA STRUCTURE

(Admissions of 2001 and onwards)

Time 3 *Hours* *Maximum Marks* 75

(Write your Roll No on the top immediately on receipt of this question paper)

Attempt ***all*** *questions*

Parts of a question should be answered together

1 (a) Given the following class 'String' (2 + 2 + 2 = 6)

Class String

{ char *S,

.

}

(i) Give appropriate constructors to initialize objects of this class

(ii) Write a member function to overload operator + to concatenate two strings without the use of streat function

(iii) Write a member function to check whether a particular string is a palindrome or not

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(b) Compare (2 + 2 + 2 = 6)

(i) char * const p and char const * p

(ii) in line functions and macro giving example

(iii) structures and unions giving example

(c) Consider the following declarations (2 + 2 = 4)

int A[] = {1, 2, 3}, *p = A,

What will be the contents of A and p after executing individually (not in sequence)

(i) *p++,

(ii) (*p)++,

2 (a) Using only pointers (no array indexing) write (4 + 4 = 8)

(i) a C++ function to perform merging of two integer arrays by overloading operator "+".

(ii) a C++ function to add all numbers in an integer array

(b) Explain (3 + 2 + 3 = 8)

(i) Reference parameters Why is an object always passed to a copy constructor by reference ?

(ii) Static member functions can access only static data of that class ?

(iii) Early and late binding How is the latter achieved in C++ using pure virtual functions ?

3 (a) Write a C++ program to evaluate a postfix expression using a stack The evaluation function should be a friend function 5

(b) Write a recursive function in C++ for finding the sum of the following series upto n terms 3

$$1 + 1/2 + 1/3 +$$

(c) Remove tail recursion and give its iterative version for the following code 3

```
int product (int m, int n)
{
    if (n==1) return 1,
    else return (m + product (m, n-1)),
}
```

(d) Give template class definition for a doubly linked list Write a member function to delete all odd numbered nodes from this linked list 5

4 (a) Write a member function to perform each of the following operations on a Binary Search Tree (BST) (3 + 3 + 3 = 9)

(i) Calculate the height of the tree

(ii) Delete a node by merging

(iii) Traverse the tree level by level

(b) A tridiagonal matrix D of size n × n has all non-zero entries on the three central diagonals Suppose

this matrix is mapped to a one dimensional array A by diagonals, starting with the lowest diagonal Obtain the formula for the location of an element D(i, j) in A 3

(c) What are threaded tree? Give an algorithm for traversing a BST inorder using threaded trees 4

5 (a) What are the advantages of a circular queue over a linear queue ? Create a template for implementing a circular queue of data type X Write functions for insertion and deletion for this queue. 6

(b) Write a C++ program to add two large integers using singly linked lists 5