(13)

[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1527 **G**

Unique Paper Code : 2342012301

Name of the Paper : Data Structures

Name of the Course : **B.Sc. (H) Computer Science**

Semester : III (DSC)

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. **All** questions in **Section A** are compulsory.
3. Attempt any **four** questions out of **six** in **Section B**.

Section – A

1. (a) What will be the maximum number of nodes in a Binary tree with depth d? (2)

(b) What would be the output after the code segment is executed on the follow list

$10 \rightarrow 30 \rightarrow 20 \rightarrow 90 \rightarrow 100$

```
node *p;

p = head;

while(p->next->next)

{

   p=p-> next;

}

cout<< p-> data;
```

(c) For the given queue - a, b, c, d, List t

(d) Store the following univariate polynomial in a sin
linked list

$$5x^3 - 6x^2 - 3x + 2$$

(e) Solve the following recurrence relation us
Master's theorem-

$$T(n) = 2T(n/2) + n\log n$$

(f) Write a function for finding the minimum elem
in a Binary Search tree

(g) void fun(int x)

```
{
if (x>0)
{
fun( x-1);
cout << x;;
```

```
    }
}
void main()
{
    fun(3);
}
```

What will be the output for the abov
snippet? Create a recursion tree for the

(h) Convert the following expression to postfi
a stack. Show the status of stack afte
operation

(A+B) * (C-D) / F – X*Y / Z

(i) Given a two dimensional array A[5][10
stored at address is 1000 and each eleme
size 4. Find the address of A[3][5] using b
major and column major order.

Section – B

2. (a) What is the advantage of using a doubly linked list over a singly linked list? Write a function to remove duplicate elements from a sorted doubly linked list. (2+6)

(b) Draw a binary tree T such that (5+2)

- Each node of T stores a single character
- A preoder traversal of T yields *mnopxyz*
- An inorder traversal of T yields *npomyzx*

Also give the post-order traversal of T

3. (a) Write a function to count all the occurrences of an element in an integer type array. (5)

(b) Evaluate the following postfix expression using a stack. Show every step.

43 * 2 / 1 8 2 ^ ^ + 2 – 3 +

(^ operator depicts exponent) (5)

P.T.O.

(c) Draw the expression tree for the following : (3

2 + 5 * 3 ^ 2 + 9 + ((1+8) * 3)

4. (a) For a given set of values, write a program f printing the Next Greater Element (NGE) for eve element. Use stack data structure. Write the NG for the following elements 4,5,2,25. Also, expla the time complexity of the code. (6+2+

(b) Write a recursive function for computing n Fibonacci number via binary recursion. (

5. (a) Create a class to implement ADT queue usi two stacks. Write functions - enqueue, dequeu and empty. (3+

(b) Let $f(n) = 3n^2 + 4n \log n + 5n$. Show th $f(n) \in O(n^2)$. (

(c) Sort the following array using insertion sort

10, 9, 11, 7, 8, 5

Show the status of array after each iteration. (4)

6. (a) Create an AVL tree by inserting the following items successively. Show the status of tree after each insertion

10, 15, 50, 12, 11, 30, 40, 60, 7

Delete 15 from the above tree. (6+4)

(b) Write a function to return the i^{th} element of a singly linked list. Compare the time complexity of accessing an element in an array and a linked list. (3+2)

7. (a) Consider a max heap with following values-

50, 30, 20, 15, 10, 8, 16

(i) Insert a new node with value 60.

(ii) Delete a node with value 50. (5)

P.T.O.