

**B.Tech. - VIEP - COMPUTER SCIENCE AND  
ENGINEERING (BTCSVI)**

**Term-End Examination**

**December, 2015**

**BICS-007 : DATA STRUCTURES**

*Time : 3 hours*

*Maximum Marks : 70*

**Note :** *Question no. 1 is compulsory. Answer four other questions. All questions carry equal marks.*

1. (a) Distinguish between the following : 6
- (i) Linear and Non-linear data structures
  - (ii) Infix and Postfix expressions
  - (iii) Polynomial and Exponential order of complexity
  - (iv) Breadth first search and Depth first search
- (b) Describe the data structure to represent : 8
- (i) Sparse Matrix
  - (ii) Priority Queue
  - (iii) Threaded Link
  - (iv) An algebraic expression of the form :
 
$$a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$
2. (a) Give formal definitions for complexity measures  $\Theta$ ,  $\Omega$  and Big oh. Illustrate them, taking bubble sort algorithm as an example. 7

- (b) Calculate the time complexity function for the following code :

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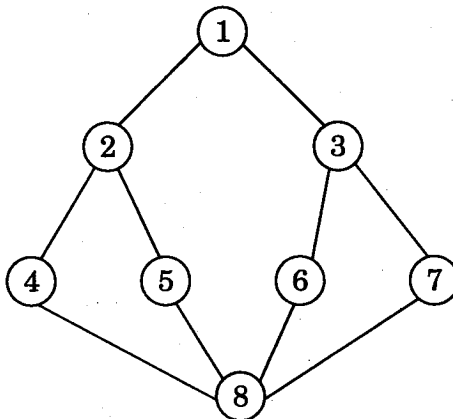
```
Func (int n)
{
    If (n <= 2)
        return;
    else
        Func (sqrt(n)) + Func (sqrt(n));
}
```

3. (a) What advantage do we get if we make a queue circular ? Suggest two strategies for finding a circular queue to be empty or full with their advantages and disadvantages.

7

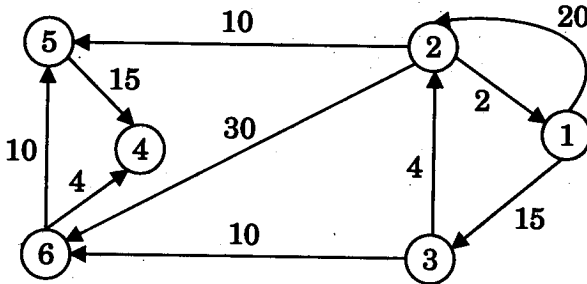
- (b) Represent the following graph by an adjacency list. For what purpose is the adjacency list better than the adjacency matrix representation ?

7



4. (a) Find the shortest paths from the vertex 1 to all the remaining vertices in the following weighted digraph. Give all the steps.

7



- (b) A particular binary search tree has the following known about it :

Pre-order traversal yields

88, 6, 1, 3, 2, 5, 4, 30, 10, 20.

Post-order traversal yields

2, 4, 5, 3, 1, 20, 10, 30, 6, 88.

Draw this tree.

7

5. (a) Prove that the quick sort takes  $O(N \log_2 N)$  time to sort  $N$  elements on the average.

6

- (b) Draw the heap structure that results from insertion of the following elements in the given order into an initially empty heap :

40 80 35 90 45 50 70

Also show the result after deletion of the root of this heap.

8

6. (a) What are the properties of a hashing function ? Write the difference between collision and overflow. Why do they arise ? Explain the consequences, if any.

8

- (b) Discuss various approaches to resolve overflows, giving examples.

6

7. (a) Why do you require tree balancing ?  
Compare the complexity of searching an unbalanced binary search tree with a balanced one. What is the complexity of balancing by AVL method ? 7

(b) Write the procedure to reverse a single linked list without creating an extra linked list. 7

8. Write short notes on any *four* of the following :  $4 \times 3 \frac{1}{2}$

- (a) Garbage Collection
  - (b) Symbol Table
  - (c) AVL Trees and its applications
  - (d) Abstract Data Types
  - (e) B-Tree
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