

## C0-R4.B3: DATA STRUCTURE THROUGH JAVA

### NOTE:

1. Answer question 1 and any FOUR from questions 2 to 7.
2. Parts of the same question should be answered together and in the same sequence.

Time: 3 Hours

Total Marks: 100

1.

- a) What is polymorphism in programming? Mention the concepts to implement polymorphism in JAVA.
- b) Define Inheritance with a suitable example. Why multiple inheritance is not supported in java?
- c) Define time complexity of algorithms. Give example of an algorithm whose time complexity is quadratic in big O notation.
- d) What are recursive functions? What are the advantages and disadvantages of recursive algorithms over iterative ones?
- e) Define priority queue and also mention its applications?
- f) Write Brute-Force algorithm for pattern matching in a string.
- g) Evaluate the arithmetic expression P written in postfix notation.  
P: 6 2 3 + - 3 8 2 / + \* 2 \$ 3 + where, \$ stands for exponentiation.

(7x4)

2.

- a) What is Encapsulation in Java and OOPS? Explain with an example.
- b) Write a program in JAVA to implement two stacks using a single array.
- c) Use Radix sort algorithm to sort the following numbers. Show all the intermediate steps.  
493 812 715 710 195 437 582 340 385

(5+8+5)

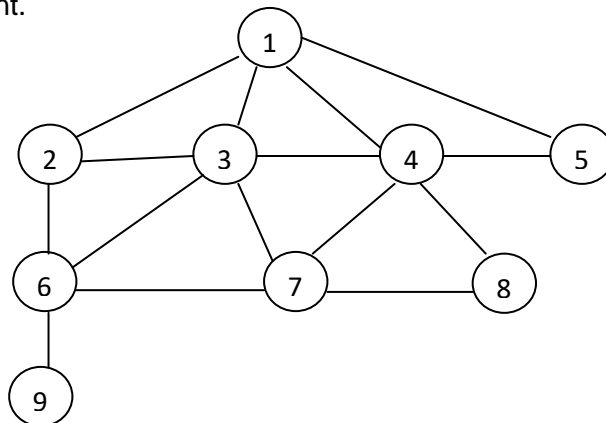
3.

- a) What do you understand by Extreme Programming? Mention the core principles one should apply during Extreme Programming?
- b) Write a recursive program in JAVA to solve the classical Tower of Hanoi problem.
- c) Write a program in JAVA to implement binary search algorithm.

(6+6+6)

4.

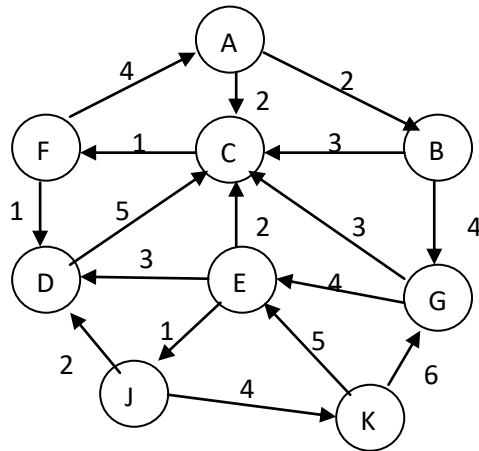
- a) Construct an AVL search tree by inserting the following elements in the order of their occurrence.  
60, 1, 10, 30, 100, 90, 80
- b) Apply Breadth First search to traverse the undirected graph shown below. Take node 1 as starting point.



- c) Define hashing and hash functions with the help of a suitable examples.

(6+6+6)

- 5.
- Create a B tree of order five by inserting the following elements in the sequence.  
1, 7, 6, 2, 11, 4, 8, 13, 10, 5, 19, 9, 18, 24, 3, 12, 14, 20, 21, 16
  - Consider the following directed graph. Find the minimum cost spanning tree using Prim's algorithm.



**(8+10)**

- 6.
- Write methods in JAVA for In-order, Pre-order and Post-order traversal of a binary search tree.
  - Explain doubly ended queue. Write algorithms for performing insertion and deletion operations on doubly ended queue.
  - Write a JAVA program to arrange a set of elements in increasing order using insertion sort.
- (6+6+6)**

- 7.
- Explain Tries in data structures with a suitable example.
  - For a binary tree, the Pre-order and In-order traversals are as given below. Draw the tree.  
Pre-order: F, B, M, A, J, C, H, I, D, K, L, E, G  
In-order: B, J, A, M, H, C, I, F, D, E, L, G, K
  - Create max heap by inserting the elements in the sequence.  
20, 35, 9, 26, 49, 78, 2, 46, 10, 15

**(6+6+6)**