

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) Describe various memory allocation strategies.
 - b) How memory is freed using Boundary tag method in the context of Dynamic memory management.
 - c) Suppose we have divided n elements into m sorted lists. Explain how to produce a single sorted list of all n elements in time $O(n \log m)$?
 - d) Execute your algorithm using quick sort for two passes using the following list as input:
66, 33, 40, 20, 50, 88, 60, 11, 77, 30, 45, 65
Describe the behavior of quick sort when the input is already sorted.
 - e) Suppose a queue is housed in an array on circular fashion. It is desired to add new items to the queue. Write down procedure ENQ to add new item that also check whether the queue is full or not. Write another procedure DQ to delete an element after checking queue's empty status.
 - f) Write a non-recursive algorithm for preorder traversal of a binary tree.
 - g) Show the linked representation of the following two polynomials.

$$7x^{80} + 5x^{50} + 3x^{30} + 1 = 0$$

$$9x^{90} + 6x^{60} + 2x^{20} - 1 = 0$$

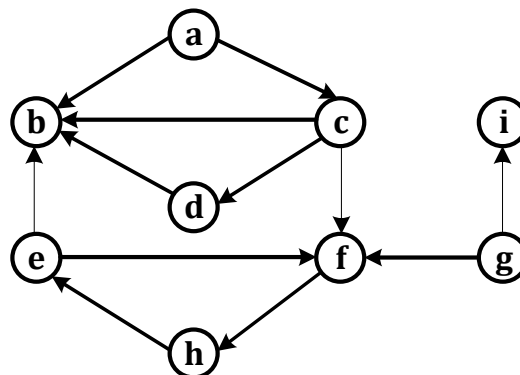
Build a procedure for adding two polynomials stored in linked list. Verify steps of your procedure for the above two polynomials.

(7x4)

2.
 - a) Write an algorithm to find solution of Tower of Hanoi problem. Explain the working of the algorithm (for 3 disks) with diagrams.
 - b) Can a Queue be represented by circular linked list with only one pointer pointing to the tail of the queue? Substantiate your answer using an example.
 - c) Write java code for binary search tree.

(7+5+6)

3.
 - a) Give the adjacency matrix and adjacency list of the following directed graph.



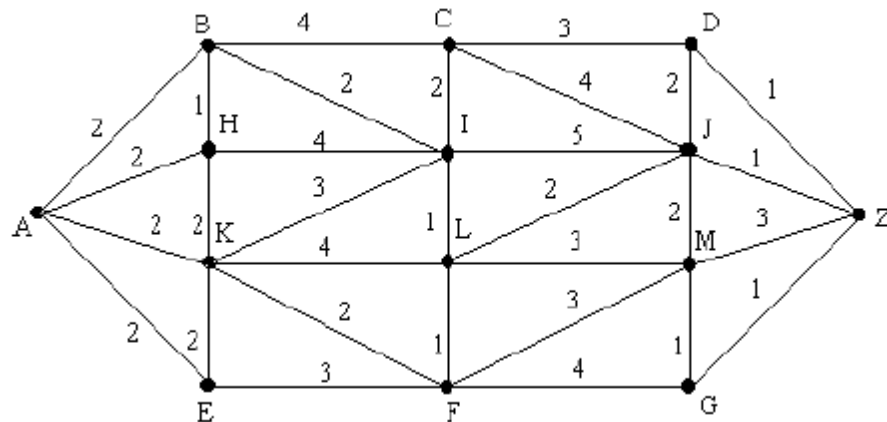
$$E=(5x-2)(3a-b)^2$$

- Draw the expression tree corresponding to E.
- Find the scope of exponential i.e the subtree rooted at the exponential operator.

(9+9)

4.

- a) Find the shortest path from **a to z** using Dijkstra's algorithm.

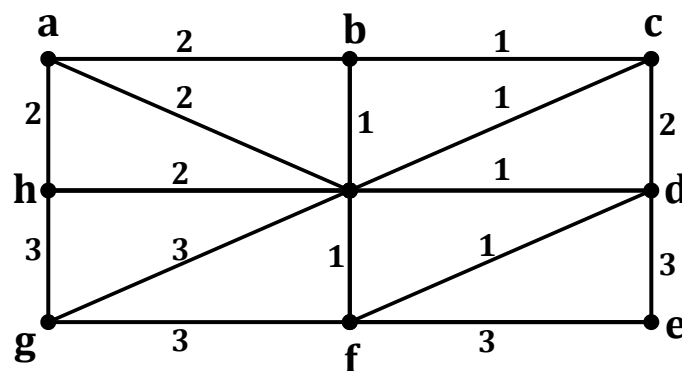


- Explain differences between systems defined data types and abstract data types with suitable example.
- Explain an efficient way to storing two symmetric matrices of the same order in memory.

(9+5+4)

5.

- a) Apply kruskal's algorithm to find minimum spanning tree of the graph in the following figure. Display execution of each step of the algorithm.



- b) The system allocates memory for any multidimensional array from large single dimensional array. Describe two mapping schemes that helps us to store a two dimensional metrics in one dimensional array.

(9+9)

6.

- a) Construct a binary tree whose node in in-order and preorder are given as follows.

preorder : G,B,Q,A,C,K,F,P,D,E,R,H

in-order : Q,B,K,C,F,A,G,P,E,D,H,R

- b) Explain various graph traversal schemes and write their merits and demerits.

(9+9)

7. Write short note on **any three** of the following:

- a) Abstract data type.
- b) Column major ordering for arrays.
- c) Adjacency multi list.
- d) Game trees.

(3x6)