The Assam Royal Global University, Guwahati

Royal School of Engineering and Technology (RSET)
B. Tech (CSE) 3rd Semester
Semester End Examination, December 2018
Course Title: Data Structures and Algorithms
Course Code: CSE022C303

Time: 3 Hours **Maximum Marks: 70**

Note: Attempt all questions as per instructions given.
The figures in the right-hand margin indicate marks.

Section – A

Q.1. Attempt **all questions**. (Maximum word limit 50) **2 x 8=16**

a. Differentiate between linear and non-linear data structures.
b. Define balance factor. When is a tree said to be balanced?
c. Why are linked lists preferred over arrays?
d. Differentiate between stack and a queue.
e. Write some applications of linked lists.
f. All trees are graphs but all graphs are not trees. Justify.
g. Differentiate between linear search and binary search.
h. What is garbage collection?

Section – B

Q.2. Answer the following questions: **(Any Two)** **6 x 2=12**

a. What is a data structure? Write a note on its classification. What are the advantages of an abstract data type? 2+2+2
b. Define complexity of an algorithm. Describe the various asymptotic notations used to represent the complexity of an algorithm. Arrange the following in their increasing order: 2+3+1

$O(\log n)$, $O(n)$, $O(n^2)$, $O(1)$

c. Write a note on the memory representation of a two-dimensional array with the help of an example. Define a sparse matrix along with its different types. 3+3

Q.3. Answer the following questions: **(Any Two)** **7 x 2=14**

a. Write an algorithm to search an element in a linked list. Also write its complexity.
b. Write an algorithm to insert and delete an element from a queue. Also write their complexities.
c. Convert the following expression to its postfix form:

$(a / (b - c + d)) * (e - f) * g$

Also evaluate the resulting expression with the following values:

$a=10, b=4, c=2, d=3, e=4, f=2, g=1$

Q.4. Answer the following questions: **(Any Two)** 7 x 2=14

a. Create a BST with the following nodes: 3+1+3

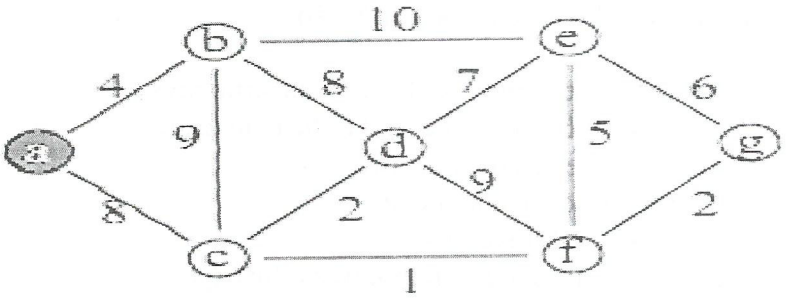
Q, B, W, R, M, C, X, A, K

Delete node 'Q' from the resulting tree and perform the three traversals on it.

b. Write some properties of m-way search trees. Create an AVL tree with the following nodes: 2+5

15, 20, 24, 10, 13, 7, 30, 36, 25

c. How are graphs represented in memory? Define a minimum spanning tree. Extract the MST from the graph given below using Prim's algorithm and find the final cost of the tree: 3+1+3



Q.5. Answer the following questions: **(Any Two)** **7 x 2=14**

a. Write an algorithm for binary search procedure. Also write its complexity.

b. Write an algorithm for bubble sort procedure. Also write its complexity.

c. Explain the quick sort technique using a suitable example.