M.Sc. (INFORMATICS)/ II Sem – 2019
Paper No: IT -22 Data Structure & Design Of Algorithms

TIME: 03 hours **Max Marks: 75**

(Write your Roll No. on the top immediately on receipt of this question paper)

(Answer any 5 Questions)

Attempt all sub-parts of a question together

Q1)

a) Explain briefly how to convert an Infix expression to Postfix expression using stack and show steps to convert the following expression:

(P – Q ^ R)/((S + T * V) + X)

b) Write a varadic function in 'C' that takes variables numbers of strings as argument and returns the largest string as an output

c) Explain with suitable example how to implement sparse matrix using linked list.

[6 + 6 + 3]

Q2)

a) Given the following data:

Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep, Oct, Nov, Dec

Create an AVL tree. Show the steps and rotations

a) Write a 'C' function that counts number of Perfect Square numbers in a circular queue implemented using circular array [9 + 6]

Q3)

b) Given the following keys, Insert them in a B-Tree of order 5 (show the steps)

D, J, I, E, N, G, K, P, M, H, V, L, U, Z, F, O, R, W, X, S

c) Write a 'C' function that receives as an input an array of integers and returns whether the array is sorted?

[10 + 5]

Q4)

a) Assume a list of numbers. We need to remove duplicates from the list.
Which data structure will be most efficient for doing the same. Write functions for the following:

i. Search an item

ii. Add an item to data structure

iii. Delete an item from data structure

b) Write a 'C' function that takes a singly circular linked list of integers as an argument (implemented with only head pointer) and find out number of odd numbers. Return the result as a reference.

[9 + 6]

Q5)

a) Given adjacency matrix A of graph G (P, Q, R, S, T)

	P	Q	R	S	T
P	0	1	0	1	0
Q	0	0	1	1	0
R	0	0	0	0	1
S	0	1	1	0	0
T	1	1	0	0	0

Briefly explain Warshall's algorithm to find the path matrix. Find path matrix of the above graph Show all the steps

b) What are various measures for resolving collisions in hashing? What are their complexities?

[10 + 5]

Q6)

a) Show the steps used in sorting the following numbers using shell sort sorting technique

12, 57, 35, 46, 24, 76, 09, 31

What is time complexity of this sorting technique?

b) Given the adjacency list a graph G

Node	Adjacency List
0	1, 2, 3
1	5, 8
2	0, 3, 6
3	4
4	5, 7
5	-
6	2, 3, 4
7	5, 6
8	3, 5

Explain BFS algorithm. Use the same to traverse the list of nodes in Graph starting from 1. Find minimum path from 1 to 0.

[7 + 8]