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MCS-021

MCA (Revised) / BCA (Revised)

Term-End Examination

09152

June, 2019

MCS-021 : DATA AND FILE STRUCTURES

Time : 3 hours *Maximum Marks : 100*
(Weightage : 75%)

Note : *Question number **1** is **compulsory**. Attempt any **three** questions from the rest. All algorithms should be written nearer to 'C' language.*

1. (a) Order the following functions by their complexity in increasing order : *3*

(i) n!

(ii) 3^n

(iii) $\sqrt{n}$

(iv) $\log_2 (n!)$

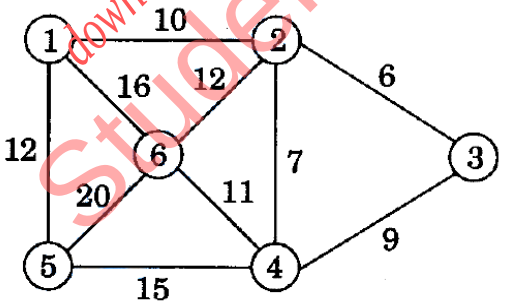
(b) For the function defined by $f(x) = 2x^3 + 4x + 1$, show that $f(x) = O(x^3)$ using the definition of O (big Oh). *4*

(c) Convert the following prefix notation into infix notation : 3

+ – * ** ABCD/E/F + GH

(d) Write an algorithm to reverse a string using a stack. Illustrate all the intermediate steps of your algorithm on the string "IGNOU". 6

(e) Use Kruskal's algorithm to construct a minimum cost spanning tree of the following graph : 6



(f) Apply 2-way mergesort for sorting the following numbers and show all the intermediate steps : 6

4 6 3 7 1 9 2 8 5

(g) Insert the following data items into a B-Tree of order 5 : 6

a b e h p c k d m l n u t x y

(h) Explain how a polynomial can be represented using an array. Write an algorithm to add two polynomials. 6

2. (a) Write an algorithm to do insertion sort and analyze its run-time complexity. 10

(b) Write a program that accepts a set of integers and creates a singly linked list of these integers. Then it should prompt for input of an integer and delete the node consisting of that integer from the singly linked list. 10

3. (a) Write a recursive algorithm of preorder and inorder traversal of a binary tree and explain it. 10

(b) What is a strongly connected component of a graph ? Write an algorithm for finding strongly connected components of a graph. 10

4. (a) Explain Floyd-Warshall's all pair shortest path algorithm. How is it different from single source shortest path ? 10

(b) Given the input file
(5, 10, 15, 8, 20, 16, 28, 35, 55, 40, 30),
construct

(i) A binary tree 3

(ii) Heap 4

(c) Draw the graph corresponding to the following adjacency matrix : 3

	a	b	c	d
a	0	1	1	0
b	1	0	0	1
c	1	0	0	1
d	0	1	1	0

5. (a) Construct an AA-tree using the following numbers (nodes). Show all the intermediate steps and balancing of tree. 10

7 14 21 80 4 50 30 40

(b) Write important properties of : 10

(i) Binary search tree

(ii) Red black tree