WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 3rd Semester Examination, 2020, held in 2021

CMSACOR05T-COMPUTER SCIENCE (CC5)

DATA STRUCTURE

Time Allotted: 2 Hours | Full Marks: 40

The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.

Answer Question No. 1 and any *four* from the rest

1. Answer any ***four*** questions from the following: 2×4 = 8

   (a) State the difference between linear and non-linear data structure.

   (b) What are the limitations of recursion?

   (c) In which situation linear search is advantageous than binary search?

   (d) What is "Saddle Point" of a matrix?

   (e) Each element of an array A[20][50] requires 4 bytes of storage. Base address of A is 2000. If the array is stored in column major order then find the location of A[10][10]?

   (f) Define ADT.

   (g) State the difference between internal sorting and external sorting techniques.

2. (a) Prove that a tree with n nodes has exactly $n-1$ edges. 4

   (b) Prove that $n_0 = n_2 + 1$, where n_0 is the number of leaf vertices, and n_2 is the number of vertices of degree 2 of a non-empty binary tree. 4

3. (a) What is BST? 2

   (b) Insert the following keys in the order given below to build them into an AVL tree. 6
   g, h, s, l, e, m, t, u.

   Clearly mention different rotations use and balance factor of each node.

4. (a) How can a polynomial such as $6x^6 + 5x^3 - 2x + 10$ be represented by a linked list. 2

   (b) Transform the following expression to the expression in Postfix notation: 4

   $$A * (B + D)/E - F * (G + H/K)$$

(c) Why is the Queue Data Structure called FIFO? 1

(d) The following sequence of operations is performed on a stack: 1

push(1), push(2), pop, push(1), push(2), pop, pop, pop, push(2), pop.

What should be the sequence of popped out values?

5. Write the selection sort algorithm. Sort the following list of elements using selection sort and also calculate the number of comparisons required: 3+3+2

15 –31 23 –19 37 0 9 29

6. (a) Write the conditions for checking circular queue empty and circular queue full. 2+2

(b) What is a Sparse Matrix? Give a storage efficient method for storing a sparse matrix. 1+3

7. (a) Why the hash functions need to be simple? 2

(b) Define collision. Discuss two collision resolution techniques and compare their performances. 2+4

8. Write short notes on (any ***two***): 4+4

(a) Collision resolution by quadratic probing

(b) Threaded binary trees

(c) Tail recursion.

N.B. : *Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.*

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