DATA STRUCTURE AND ALGORITHM (SEMESTER - 4)

CS/B.Tech (FT)/SEM-4/CS-415/09
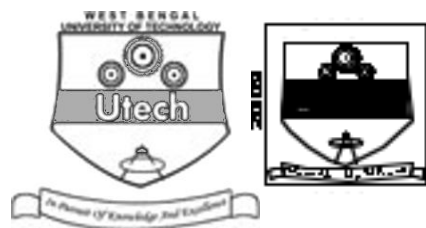
1. ....
  Signature of Invigilator

2. ....
  Signature of the Officer-in-Charge

Reg. No.

Roll No. of the Candidate

CS/B.Tech (FT)/SEM-4/CS-415/09

ENGINEERING & MANAGEMENT EXAMINATIONS, JUNE – 2009

DATA STRUCTURE AND ALGORITHM (SEMESTER - 4)

Time : 3 Hours]   [Full Marks : 70

INSTRUCTIONS TO THE CANDIDATES :

1. This Booklet is a Question-cum-Answer Booklet. The Booklet consists of **32 pages**. The questions of this concerned subject commence from Page No. 3.

2. a) In **Group – A**, Questions are of Multiple Choice type. You have to write the correct choice in the box provided **against each question**.

   b) For **Groups – B** & **C** you have to answer the questions in the space provided marked 'Answer Sheet'. Questions of **Group – B** are Short answer type. Questions of **Group – C** are Long answer type. Write on both sides of the paper.

3. **Fill in your Roll No. in the box** provided as in your Admit Card before answering the questions.

4. Read the instructions given inside carefully before answering.

5. You should not forget to write the corresponding question numbers while answering.

6. Do not write your name or put any special mark in the booklet that may disclose your identity, which will render you liable to disqualification. Any candidate found copying will be subject to Disciplinary Action under the relevant rules.

7. **Use of Mobile Phone and Programmable Calculator is totally prohibited in the examination hall.**

8. You should return the booklet to the invigilator at the end of the examination and should not take any page of this booklet with you outside the examination hall, **which will lead to disqualification**.

9. Rough work, if necessary is to be done in this booklet only and cross it through.

No additional sheets are to be used and no loose paper will be provided

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FOR OFFICE USE / EVALUATION ONLY
Marks Obtained

						Group – A						Group – B			Group – C			Total Marks	Examiner's Signature
Question Number																			
Marks Obtained																			

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Head-Examiner/Co-Ordinator/Scrutineer

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SEMESTER - 4

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GROUP – A

(Multiple Choice Type Questions)

1.   Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

   i)   Reverse Polish notation is often known as

   a)   Infix   b)   Prefix

   c)   Postfix   d)   None of these.

   ii)   Which of the following algorithm should execute the slowest for large values

        of N ?

   a) $O(N)$ b) $O(N^2)$

   c) $O(\log 2\ N)$.   d)   None of these.

   iii) The evaluation of the postfix expression 2 3 5 7 $*$ $-$ 12 $+$ $*$ is

   a) -12 b)   12

   c)   0   d)   None of these.

   iv)   A machine needs a minimum of 100 sec to sort 1000 names by quick sort. The

        minimum time needed to sort 100 names will be approximately

   a)   72.7 sec   b)   11.2 sec

   c)   50.2 sec   d)   6.7 sec.

v) Linked lists are not suitable for

   a)   Stack   b)   Deque

   c)   AVL Tree   d)   Binary search.

vi) What will be the time complexity for selection sort in best case to sort an array of n elements ?

   a) $O (\log n)$ b) $O (n \log n)$

   c) $O (n)$ d) $O (n^2)$.

vii) The depth of a complete binary tree with n nodes is

   a) $\log (n + 1) - 1$ b) $\log (n)$

   c) $\log (n - 1) + 1$ d) $\log (n) + 1$.

viii) In a binary search tree, if the number of nodes of a tree is 9, then the minimum height of the tree is

   a)   9   b)   5

   c)   2   d)   4.

ix) Dynamic memory allocation use

   a)   Calloc   b)   Malloc

   c)   Free   d)   All of these.

x) A vertex with degree one in a graph is called

   a)   Leaf   b)   Pendant vertex
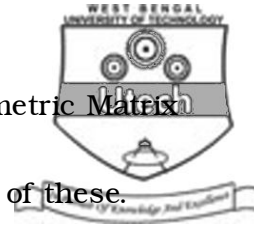
   c)   End vertex   d)   None of these.

xi) Adjacency matrix of a diagraph is

    a)   Identity Matrix   b)   Symmetric Matrix

    c)   Asymmetric Matrix   d)   None of these.

xii) Which method of traversal does not use stack to hold nodes that are waiting to be processed ?

    a)   Breadth-first   b)   Depth-first

    c)   D-search   d)   None of these.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following.   3 × 5 = 15

2.   a)   Define O and Ω notations.

    b) $T (n) = 4n^2 + 3n \log n$, Express $T (n)$ in Big (O) notations.   3 + 2

3.   a)   How the polynomial $3x^4 - 11x^2 + 9$ can be represented using a linked list ?

    b)   Compare and contrast between an array and a single linked list.   2 + 3

4.   a)   Consider the array int a [20] [20] and the base address 2000, then calculate the address of the element a [5] [6] in the Row and Column major ordering.

    b)   What is the advantage of Circular Queue over Linear Queue ?   3 + 2

5.   What do you mean by Recursion ? Write down the algorithm to solve TOWER OF HANOI problem. Hence show that the no. of moves = $2^n - 1$ (where n is the no. of Discs).   1 + 3 + 1

6. What is binary tree ? Construct a binary tree using the Inorder and Postorder traversal of the node given below :

Inorder :   D B F E A G C L J H K

Postorder :   D F E B G L J K H C A.   1 + 4

GROUP – C

(Long Answer Type Questions)

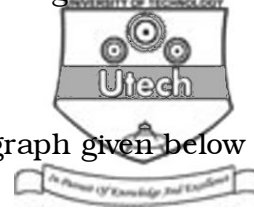Answer any *three* of the following.   3 × 15 = 45

7. a) Why stack is called LIFO List ? Convert the following Infix expression into its corresponding Postfix expression using stack and mention the algorithm.

Infix expression : $A + (B * C – (D / E ^ F) * G) * H$.   2 + 5

  b) Compare and contrast between Recursion and Iteration.   3

  c) Write an algorithm to inseret the element into Circular Queue.   3

  d) Define Priority Queue.   2

8. a) Write an algorithm to reverse a single linked list.   3

  b) What is Doubly Linked List ? What are the advantages and disadvantages of Doubly Linked List over Single Linked List ?   4

  c) Write the Quick sort algorithm and mention its time complexity.   3

  d) Write the Bubble sort algorithm and explain it with an example.   5

9. a) Define AVL Tree with an example. Insert the following keys in that sequence into an AVL Tree and clearly mention the Rotations :   2 + 6

6, 3, 1, 2, 4, 5, 9, 7

  b) Prove that for any non-empty binary tree T, if n_0 is the number of leaves and n_2 is the number of nodes of degree 2, then $n_0 = n_2 + 1$.   4

  c) What do you mean by Threaded binary Tree ? Explain with an example.   3

10. a) What is a complete graph ? Show that the sum of degree of all the the vertices in a graph is always even. 5

b) Write down the DFS algorithm and Traverse the graph given below : 7

Take the vertex *b* as source

Dia.

c) Write down the names of some popular Hash functions. 3

11. Write the short notes on any *three* of the following : 3 × 5

a) Dijkstra's algorithm for finding shortest path

b) Dequeue

c) Collision Resolution Techniques

d) Prim's algorithm

e) Comment critically : " Time complexity of Quick sort and Merge sort algorithm is same but we prefer to use Quick sort algorithm".

END