

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR

B.A./B.SC. SECOND SEMESTER (January – June) 2013

Mid-Semester Examination, March 2013

Date : 04/03/2013

COMPUTER SC. (Honours)

Time : 11 am – 1 pm

Paper : II

Full Marks : 50

Group-A (Data Structure)

Answer *question no. 1* and *any two* from the rest

1. Answer *any one* from the following:

a) Let A be a 2D array of order $n \times m$. Establish an Address calculation formulae to find the location of the element at $A[i][j]$ using row-major order. 3

The integers 1,2,3,4 are to be pushed into stack in that order. They may be popped out of the stack in any valid order during push. The integers which are popped out produce a permutation of the numbers. Which of the following permutation can never be produce in such a way?

i) 1,2,3,4 ii) 4,3,2,1 iii) 4,2,3,1 iv) 3,2,4,1 2

b) It is required to search an arbitrary array of n elements to find the element closer to a given number. Derive an algorithm based on principle of linear search. Assuming that given number is not equal to any of the array elements. 4

What will be the time complexity if we perform Binary search algorithm on $\log_2 n$ elements?
[Assume that the list of elements are sorted in descending order] 1

2. a) Briefly, differentiate between ADT & Data Structure. 3

b) Outline an ADT for One dimensional Array. 7

3. a) “Execution of a Polish expression is much faster than its equivalent infix expression”-true or false? Justify. 2

b) Consider the following arithmetic expression P, written in Postfix notation:

12, 7, 3, -, /, 2, 1, 5, +, *, +

Using proper algorithm evaluate the postfix expression. 3

c) “There is a simple way to use a singly-linked list to implement both insertion and deletion operations in $O(1)$ time” – true or false ? Justify. 2½

d) How does insertion and deletion operation take place in case of double-linked list? 2½

4. a) How a Run-time stack handles a nested procedure call? Illustrate 3

b) Compare and contrast between Iteration and Recursion. Why Tail Recursion is generally been avoided? 2 + 3

c) Give one example where recursion gives much better results than iteration and also, Give one example where iteration gives much better than recursion. 2

Group-B (Numerical Analysis)

Answer **question no. 5 & 6** and **any one** from the rest.

5. Answer **any two** from the following:

2 x 2½

a) What are different type of errors, could be occur during numerical computation Explain with examples.

b) Define the following terms:-

Feasible solution, Basic solution, Unbounded solution

c) Prove that $\Delta \cdot \nabla = \Delta - \nabla$ where Δ and ∇ holds their as usual meaning.

6. a) Write down the given linear programming problem in a standard form.

Minimize $z = 4x_1 - 5x_2 + 7x_3$

Subject to $x_1 + x_2 + 7x_3 \leq 50,$

$x_1 + 9x_2 - 5x_3 \geq 40,$

$5x_1 + 35x_2 = 20,$

$|3x_2 + 4x_3| \leq 100,$

$x_1, x_2 \geq 0, x_3$ is unrestricted in sign.

5

OR

b) i. Define L.P.P.

1

ii. What are the advantages and limitations of linear programming problem method?

3

iii. Give some example of applications of linear programming.

1

7. a) Establish the Newton's Forward Interpolation Formula.

5

b) Establish the relation between difference operator Δ and $D(= d/dx)$ of differential calculus.

3

c) Find the relative percentage error in computation of $x+y$ for $x = 11.75$ and $y = 7.23$ having absolute error $\Delta x = 0.002$ and $\Delta y = 0.005$ respectively.

2

d) Evaluate $\int_0^1 x^3 dx$, by Trapezoidal Rule, with $n=5$, and find the relative error in your result.

5

8. a) State Gauss Legendre Quadrature formula for equidistant ordinates.

2

Hence deduce the Composite Simpson's One-third rule.

4

b) Write down the geometrical interpolation of Simpson's One-third rule.

3

c) Evaluate $f(1.5)$ and $f(2.9)$ from the table :-

5

x :	0	1	2	3
$f(x)$:	1	2	11	34

d) Round-off the following numbers correct up to 4-decimal place :-

1

i) 0.235452 ii) 0.2981509.