

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. SECOND SEMESTER EXAMINATION, MAY-JUNE 2013

FIRST YEAR

COMPUTER SCIENCE (Honours)

Date : 20/5/2013

Time : 11 am – 3 pm

Paper : II

Full Marks : 75

[Use separate Answer Books for each group]

Group – A

Answer **any four** questions :

1. a) Consider the array $\text{int } a[10][10]$ and the base address 3000, then calculate the address of the array $a[2][3]$ in the row and column major ordering. Assume that the index of the array starts at $a[1,1]$. [3]
b) Write the advantage of circular queue over linear queue. [2]
c) What is binary tree? Construct a binary tree using the in-order and post-order traversal of the node given below : [2+3]
In order : D B F E A G C L J H K
Post order : D F E B G L J K H C A
2. a) Define AVL tree. [1]
b) Construct an AVL tree using the list below : [5]
12, 11, 13, 10, 9, 15, 14, 18, 7, 6, 5, 4 (show all the steps)
c) What are the differences between AVL tree and binary search tree. [2]
d) What is the use of Huffman coding? [2]
3. a) State the advantage and dis-advantages of recursion in programming. [2]
b) Suppose the Fibonacci numbers F_1 & F_2 are given. should one use recursion or iteration to obtain F_6 ? Justify. [2]
c) Write an algorithm to delete a node X from double linked list. Consider all cases. [6]
4. a) Define Red-Black tree. [2]
b) Construct a Red Black tree with the following key values :
30, 20, 40, 25, 22 [3]
c) Prove that a complete binary tree of height $h \geq 0$ contains atleast 2^h and atmost $2^{(h+1)}-1$ nodes. [5]
5. a) How the polynomial $4x^3 - 15x^2 + 8$ can be represented using a linked list. [2]
b) Compare and contrast between an array and a single linked list. [3]
c) Write an algorithm to insert an item into a single linked list in such a way that after inserting the item the link list is always maintained in ascending order. [5]
6. a) What are input restricted deque & output restricted deque? [4]
b) Show the hash table that results when the letters in "COMPUTER SCIENCE" are stored in the given order using linear probe collision resolution method. Assume a hash table of size 19 and use hash function $h(K) = K \bmod 19$ for the K-th letter of the alphabet. [6]

Group – B

Answer **any one** question from 7&8 :

7. Transform the following L.P.P. into standard maximization form : [5]
Minimize $z = 2x_1 + x_2 - 6x_3 - x_4$
Subject to $3x_1 + x_4 \leq 25$
 $x_1 + x_2 + x_3 + x_4 = 20$
 $4x_1 + 6x_3 \geq 5$
 $2 \leq 2x_1 + 3x_2 + 2x_4 \leq 30$
where $x_1, x_2, x_4 \geq 0$ and x_3 is unrestricted in sign.

8. a) Write down the differences between Newton-Raphson and Secant method. [1]
 b) Find the 1st approximation of the root lying between 0 and 1 of the equation $x^3 + 3x - 1 = 0$ by Newton-Raphson formula. [4]

Answer **any three** from the following :

9. a) A departmental head has four subordinates and four tasks to be performed. The subordinates differ in efficiency and the tasks differ in their intrinsic difficulty. His estimate of the time each man would take to perform each tasks, is given in the matrix below :

Tasks :	Men			
	E	F	G	H
A	18	26	17	11
B	13	28	14	26
C	38	19	18	15
D	19	26	24	10

How should the tasks be allocated, one to a man, so as to minimize the total man-hours? [7]

- b) What do you mean by Truncation and Round-off Error. [3]
 10. a) Why bi-section method is called bracketing method? [2]
 b) Use Vogel's Approximation Method to obtain an initial basic feasible solution of the transportation problem : [8]

	D	E	F	G	Available
A	11	13	17	14	250
B	16	18	14	10	300
C	21	24	13	10	400
Demand	200	225	275	250	

11. a) Establish the Newton's Forward Interpolation Formula. [5]
 b) Using appropriate interpolation formula, compute $f(2)$ from the given table : [5]

x :	0	1	3	4
f(x) :	5	6	50	105

12. a) Write down the Method of Bisection for estimating the root of a given equation. Also state the convergency of this method. [5]
 b) Explain the procedural difference between Secant Method and Regula-falsi Method to estimate the root of a given function. [3]
 c) What is the sufficient condition of system of equations for convergence of Gauss-Jacobi Iteration? [2]
 13. a) Solve the following problem using Runge-Kutta method of order 4 :
 $y' = 1 + y^2$, $y(0) = 0$ on $[0, 1]$, with step size $h = 0.1$. [7]
 b) Write down the algorithm of Runge-Kutta Method.

Or,

Write down the difference between Euler's and R.K Method [3]

