BITS PILANI, DUBAI CAMPUS
II Semester13-14
Comprehensive Examination – Closed Book

Course No. & Title: CS F211, Data Structures & Algo **Duration: 3 Hrs**
Weightage: 35% **Max Marks: 35** **Date: 29.05.14**

ANSWER ALL QUESTIONS SEQUENTIALLY

1. Write any two advantages of data abstraction. 1 M

2. Convert the expression 5 * (6 + 2) – (12 / 4) to postfix using a stack. Show the detailed working in the form of a table as mentioned below. 3 M

Step No.	Symbol Scanned	Stack	Postfix Expression

3. Write a Pseudo procedure as mentioned below to convert an input decimal number N to its binary equivalent using a stack. Using this procedure convert the decimal number 18 into binary showing the contents of the stack in each step. 4 M

   Procedure Decimal-to-Binary
   Input : N a decimal Number
   Output : B the binary equivalent of N

4. Consider the following circular queue capable of accommodating maximum 6 elements and REAR = 4, FRONT = 2 and the contents of the QUEUE are

Index	1	2	3	4	5	6
Element		L	M	N		

   Show the contents of the queue after each of the following operations
   a) Add O b) Add P c) Delete two letters d)Add Q, R, S

   1M

5. Using the following structure definition of each node in a singly linked list, define a function **delete_last_node** with the following prototype to delete the last node in it.

```
struct node{
int data; struct node *link};
```

   struct node* delete_last_node(struct node *head); 3 M

6. List the typical computational time complexity functions that are used to classify algorithms in increasing order of time. 1 M

7. Define stable sorting. Sort the following array using divide and conquer merge sort.
   18 26 32 6 13 15 9 1 22 26 19 55 37 43 99 2 — 3 M

8. Define a recursive function **leafcount** with the following prototype to find the number of leaf nodes in a binary tree.
   int leafcount(struct node *root); — 3 M

9. An arithmetic expression is represented using a binary tree. Using the methods of the binary tree ADT write ***Algorithm printExpression*** to print the equivalent expression. — 3 M

10. Insert the keys 76, 26, 37, 59, 21, 65, 88 into a hash table of size m=11 using quadratic probing with c1= 1 and c2 = 3. Assume the primary hash function is $h'(k) = k \ mod \ m$. — 4 M

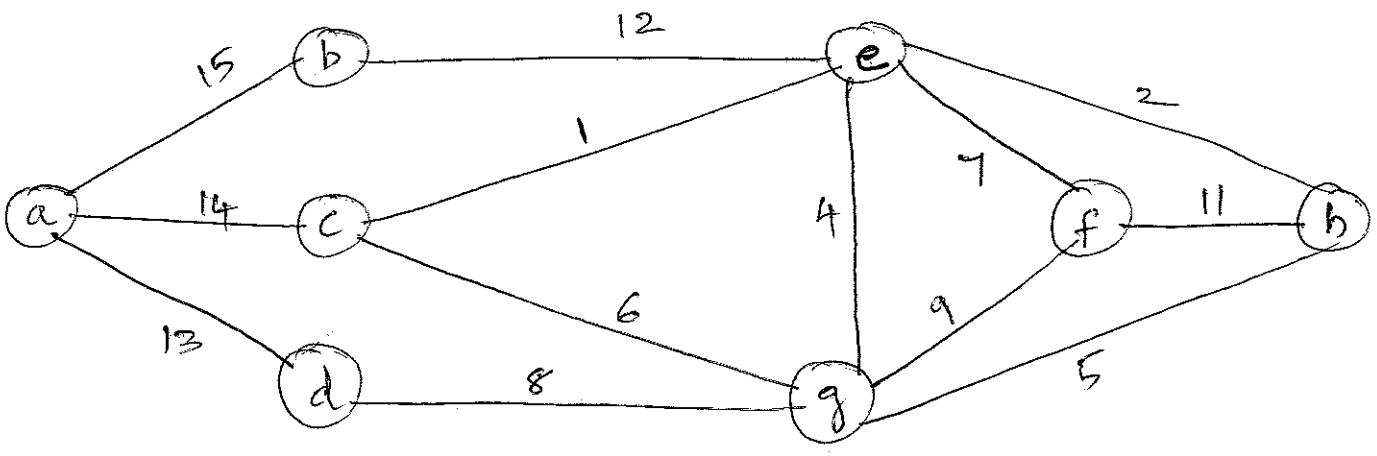
11. Insert the following keys into an initially empty AVL tree in this order. — 4 M

    BRIJESH, FIZZA, IMRAN, NAVEEN, LOVELY, PREETY, JASSI, AJIT, HENNA and DANNY.

    Draw the height balanced tree after appropriate rotations at the end of each insertion.

12. In a min heap with n elements, at which level the second smallest element will be present? Draw a min heap with elements 1, 2, 3, 4 and where 4 is the right child of the root node. — 1 M

13. Using Kruskal's algorithm find the minimum spanning tree for the following graph. Find the weight of this minimum spanning tree. — 4 M



********** BEST OF LUCK**********

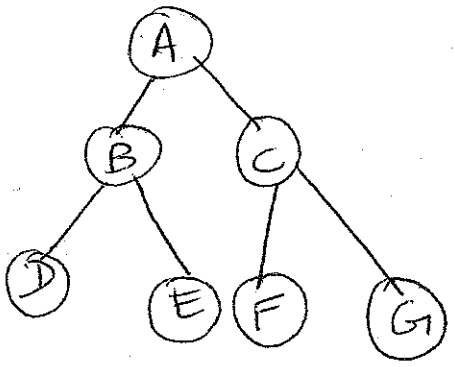
BITS PILANI, DUBAI CAMPUS
II Semester13-14
Test 2 – Open Book

Course No. & Title: CS F211, Data Structures & Algo Date: 14.04.14 Duration: 50 mins
Weightage: 20% Max Marks: 20 Class : II CS

ANSWER ALL QUESTIONS SEQUENTIALLY

1. Consider a binary tree having 8 nodes. The preorder and inorder traversals of the binary tree results in the following sequence of nodes. Draw the binary tree.
   Preorder: A B D E G H C F
   Inorder: D B G E H A C F 4 M

2. Give the array representation of the following binary tree with root node stored at array index 1. 2 M



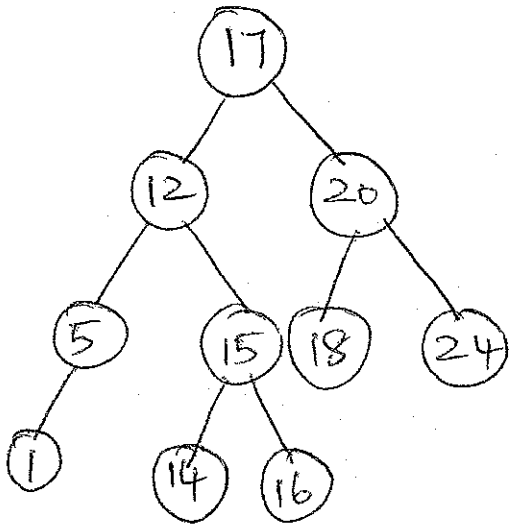
3. Define a recursive function with the following prototype to find the largest node in a binary search tree, where 'p' is the pointer to the root node.
   struct node * find_largest(struct node *p) 3 M

4. a) Using lexicographic ordering, construct a binary search tree where the nodes of the tree are the months of the year in this order inserted.
   Jan, Dec, Aug, Mar, Apr, Feb, Jul, Jun, Nov, Oct, May and Sep.

   b) Draw the tree after deleting node [redacted]: NOV. 4 M

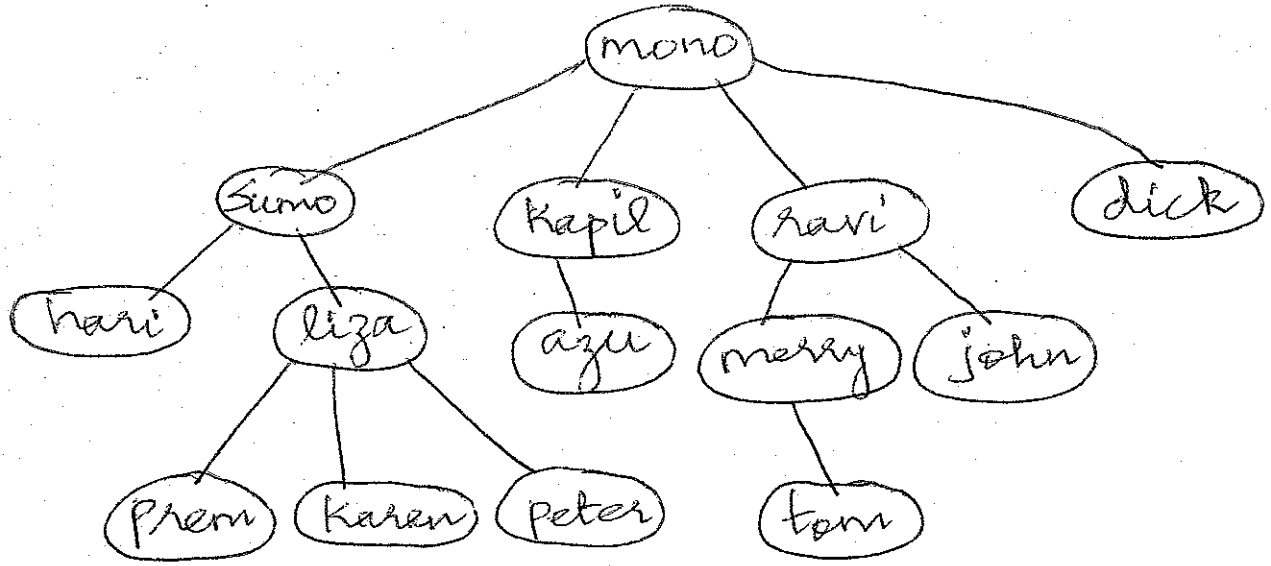
5. a) In the following binary search tree, mark the balance factor of each node and state

whether the tree is height balanced or not. If it is not a balanced tree, make it a balanced tree. 3 M



b) Insert 13 into the above tree and carry out the necessary AVL rotations if needed. Draw the final tree.

6. a) Draw the linked representation of the following general tree. 4 M
b) Write the results of the three traversals on this tree.



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BITS PILANI, DUBAI CAMPUS
II Semester13-14
Test 1 – Closed Book

Course No. & Title: CS F211, Data Structures & Algo Date: 04.03.14 Duration: 50 mins
Weightage: 20% Max Marks: 20 Class : II CS

ANSWER ALL QUESTIONS

1. Define the stack ADT with its main and supporting methods. 2 M

2. Convert the infix expression **A + (B * C – (D/E – F) * G) * H** to postfix using the corresponding algorithm with a stack data structure. Clearly show the results in a tabular form as mentioned below. 3 M

S. No	Symbol Scanned	Stack Contents	Postfix Expression

3. Evaluate the postfix expression 10 2 8 * + 3 - using stack with the help of the following table. 3 M

S. No	Symbol Scanned	Operation	Stack Contents	Output

4. An unordered list of student marks is represented using a doubly linked list. Define a function with the following prototype to find the highest mark in the list. 4 M
int highest(struct node * head);

5. A queue has to be implemented using two stacks. Define the two operations **enqueue** and **dequeue** in this case using an algorithm. 3 M

6. Given a list of integers what would be the number of comparisons a binary search algorithm will involve to search for a key in the list in each of the following a) best case b) worst case and c) average 0.75 M

7. Define a recursive function with the following prototype to find the sum of an integer array **a** of **n** numbers using recursive definition. 3 M
int recursive-sum(int *a, int n);

8. Write an algorithm to find the number of elements in a circular queue. 1.25 M

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BITS PILANI, DUBAI CAMPUS
II Semester13-14
Quiz 2 – Closed Book

Course No. & Title: CS C341, Data Structures & Algo Date: 13.05.14 Duration: 20 mins
Weightage: 7% Max Marks: 7 Class : II CS

NAME : **ID No.**

ANSWER ALL QUESTIONS

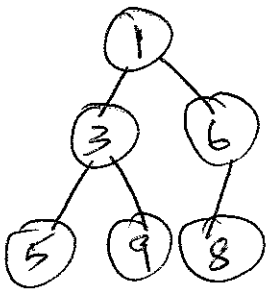
1. Define Probing 1M

   Ans:

2. Write any two advantages of hashing with open-addressing. 1M
   Ans:

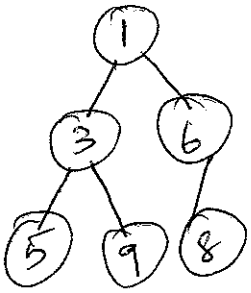
3. Insert the elements 5, 28, 19, 15, 20, 33, 12, 17 and 10 into a chained hash-table that has 9 slots. The hash function is h(k) = k mod 9. 2M
   Ans:

4. Draw the heap after removing min from the following heap. 1M



Ans:

5. Insert -2 into the following heap. 2M



Ans :

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BITS PILANI, DUBAI CAMPUS
II Semester13-14
Quiz 1 – Closed Book

Course No. & Title: CS F211, Data Structures & Algo Date: 25.03.14 Duration: 20 mins
Weightage: 5% Max Marks: 5 Class : II CS

NAME : **ID No.**

ANSWER ALL QUESTIONS

1. Mention the names of the three steps used in divide and conquer problem solving strategy. 0.5 Mark
   Ans:

2. Answer the following with respect to the merge sort tree used to analyze the running time of merge sort. 1 Mark
   a) The time spent at node v is _____
   b) The size of the sequence handled by the recursive call of node v is _____
   c) The number of nodes at level i is _____.
   d) Total time spent in all nodes at level i is _____

3. What is the running time of insertion sort when the input array is 1 Mark
   a) in reverse order Ans:
   b) in order Ans:

4. What is a stable sorting algorithm? Is quick sort a stable sorting algorithm? 0.5 Mark
   Ans:

5. Sort the following decimal numbers using radix sort. Show the results after each pass.
   321, 150, 235, 655, 573, 78, 92, 54. 1 Mark
   Ans:

6. Given two matrices $\begin{pmatrix} A & B \\ C & D \end{pmatrix}$ and $\begin{pmatrix} E & F \\ G & H \end{pmatrix}$ define the seven submatrix products used in Strassen's matrix multiplication. 1 Mark

Ans:

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