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B.E/B.Tech(Full Time) DEGREE END SEMESTER EXAMINATION, NOV / DEC 2011

COMPUTER SCIENCE AND ENGINEERING BRANCH

THIRD SEMESTER

CS9203 -PROGRAMMING AND DATA STRUCTURES - I

(REGULATIONS 2008)

Time: Three Hours

Maximum: 100 Marks

Answer ALL Questions

PART-A (10 X 2 = 20 Marks)

1. List the three types of containers in STL. Frequent insertions and deletions at both the ends of a container-Suggest the container for this.
2. What is the need of namespace and Reference variable?
3. When is a friend function compulsory? Give example.
4. What is Abstract class? Indicate the use of pure virtual functions in abstract class?
5. Identify the error in the following code.

```

Class B
{ Private: int a;
  protected : int b;
  public: int c;
}
Class D: public B
{
  public:
  void print()
  { cout << B::a;
    cout << B::b;
  }
}

```

6. How do you Rethrow an exception? Give an example code.
7. Write a function to check whether two binary search trees are structurally similar or not using (== operator) overloading.
8. Insert the following elements using B-Trees of order-3 : A C M G H Q N F W P
9. What is the use of Flow graph and Residual graph?
10. Write a routine to find the strongly connected components in a digraph.

PART-B (5 X 16 = 80 Marks)

11. a. i) Define a class Fixed_deposit that stores principal amount, period of investment, interest rate. Write a program to test your class to see that it does the following tasks. (6)

- Initialize the object Without arguments
- Initialize the object during runtime, use default interest rate
- Fixed_deposit FD1=FD2

- ii) Write a code to explain the use of the following terms. (10)
- A. Static variable and static function
 - B. Pointer to functions
 - C. Const member function
 - D. Const object
 - E. new and delete.

12. a. i) Define a class String. Write a code to Perform the following operations using operator overloading (8)
- A. String concatenation --- S1+S2
 - B. String Comparison --- S1==S2
 - C. Remove the substring from the main string S1 - S2

- ii) Explain the 3 basic Type Conversion operations with example code to perform the conversion. (8)

(OR)

- b. i) Define a class Complex_Number. Write a code to overload the following operators using Friend function. (8)
- A. C1 ++
 - B. --C1
 - C. << C1 (to print the complex number).

- ii) What is Function object? Write a program to overload the Function call operator () (8)

13. a. i) Define a Time class. Throw an exception when invalid time is an input, also how do you handle this exception? (4)

- ii) Write a class template to represent a generic vector. Include the member functions to perform the following tasks: (12)
- A. To create the vector
 - B. Modify the value of a given element.
 - C. Find the minimum element and return that element.
 - D. Write a function template for swap. Sort the elements using swap function.

(OR)

- b. i) Write a program to read the following class Hierarchy. Create a class **employee** that stores name and employee ID. Then create two derived classes, one for storing the details of **permanent employee** and **daily employees**. Through derived class object initialize the members of base class. Write a function salary to calculate the salary in both the classes

(Assume Only DA % different). A **display()** function is used in all classes to display the class contents. How do you use runtime polymorphism to display the class contents? (8)

ii) Consider the following class hierarchy. The class master derives information from both account and admin classes which in turn derive information from the class person. Define all the four classes. What will be the problem in this class hierarchy and how do you solve it. Also write a program to create, update and display the information contained in master objects. (8)

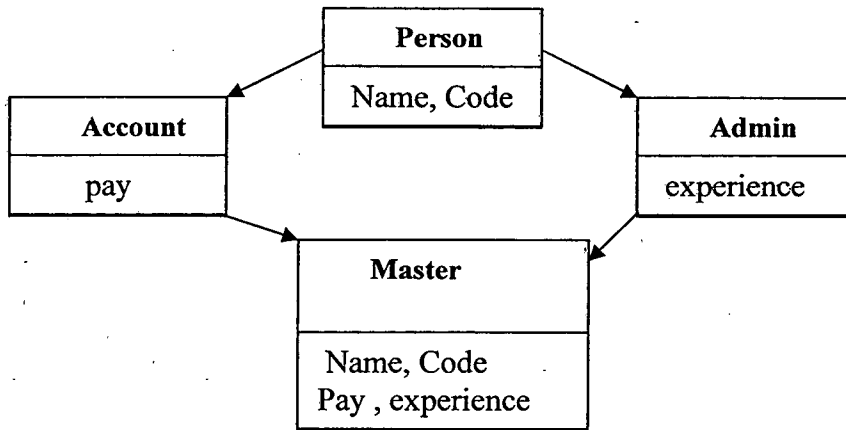
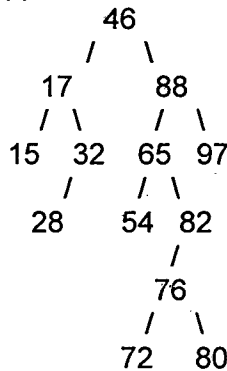


Fig 13.b

14. a. i) Do the following operations in the given tree.

A. Search (splay) the element 72 using Top down or bottom up splay approach (3)



B. Remove 46 in the above tree and Merge the two splay trees. (3)

ii) Write a routine for AVL tree insertion and Deletion. Insert the following elements in the empty tree and how do you balance the tree after each element insertion? Elements – 3, 5, 4, 6, 9, 7, 8, 2, 1, 20 (10)

(OR)

b. i) A. Insert the following elements using Red-Black tree (3)

C N G A H Q W P D X Y

B. Show the tree after removing the elements G & W (3)

ii) Write a pseudocode for Binary heap insertion and deletion. Build the heap using the following elements: 70,150,80,40,100,20,30,10,110,90,60,50,120 Also how do you find the 2nd Minimum element in the above binary heap. (10)

15. a. i) Write a Pseudocode for Dijkstra's shortest path algorithm and also trace the algorithm for the following graph. (8)

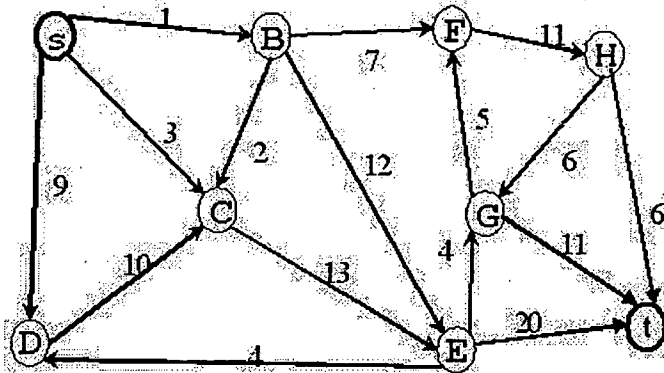


Fig 15.a

ii) Write a routine to perform Topological sort. Show the result of applying topological sort to the above graph (8)

(OR)

b. i) Write a routine to implement Kruskal's algorithm. Find the minimum spanning tree in the following undirected graph (Show the result of each stage) (8)

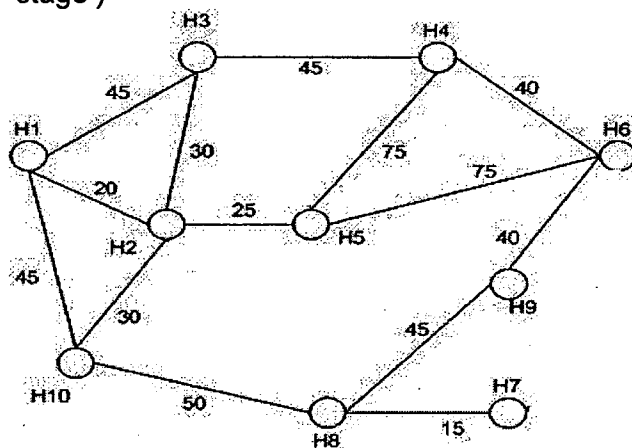


Fig 15.b

ii) Write a routine to perform a depth first search of an undirected graph. Give the DFS and articulation points for the above graph. (8)