

# Jaypee Institute Of Information Technology

Test-1 Examination- 2020-2021

B.Tech ., Odd Semester

Course Title: Data Structures

Course Code: 15B11CI311

Maximum Marks: 20

Maximum Time: 01 hr + (10 minutes for uploading)

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Not **rupesh.koshariya@mail.jiit.ac.in**? [Switch account](#)

\* Required

Name \*

Your answer

Enrollment Number \*

Your answer

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Email-ID (JIIT Gsuite ID) \*

Your answer

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## Question 1

<p>Q1) [1 mark] [CO2]</p> <p>Write a <b>one line instruction</b> in main() to create 5 objects of class T1_Questions (defined in Fig 1) as per following requirement:</p> <p>For first three objects parameterized constructor should be invoked, for fourth object default constructor should be invoked, and fifth object should be a copy of the first object and hence invokes copy constructor.</p> <pre>int main () {     // One line Instruction }</pre>	<p>Fig 1</p> <pre>class T1_Questions {     int marks;     int co; public:     T1_Questions()     {         marks=co=0;     }     T1_Questions(int m, int c)     {         marks=m;         co=c;     }     T1_Questions(T1_Questions &amp;obj)     {         marks=obj.marks;         co=obj.co;     } };</pre>
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Your answer

## Question 2 & 3

<p>Consider the code shown in Fig 2. When this code is run, compiler throws an error. Answer Q2) and Q3) based on this code:</p> <p>Q2) [1 mark][CO2] What might be reason for the error? Justify in your own words (and not compilers words)</p> <p>Q3) [1 mark][CO2] How can we create a smallerbox inside a box object?</p>	<p>Fig 2</p> <pre>class Box {     int length;     int width;     Box smallerbox; public:     Box()     {         cout&lt;&lt;"size of this object is "&lt;&lt;sizeof(*this);     } }; int main() {     Box box1; }</pre>
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#### Question 4

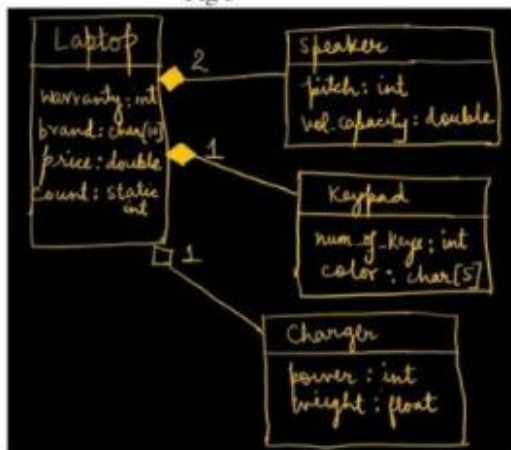
Q4) [1 mark] [CO2] Justify the Truth or False claim of the following statement with a very small example.  
Statement: "In composition, order of component constructor call depends on the order of initialization in composite class constructor."

Your answer

#### Question 5

Q5) [1 mark] [CO2] Assume that the size of a double variable is  $d$  bytes, size of integer variable is  $i$  bytes, size of a char variable is  $c$  bytes and size of a float variable is  $f$  bytes. For the class diagram given in Fig 3, what would be the size of an object of Laptop class. (Assume no alignment is done by compiler).

Fig 3



Your answer

## Question 6

Q6) [1 mark] [CO2] Identify and explain the error in following code (Fig 4).

Fig 4

```
class class1
{ public:
    virtual void fun() = 0;
};
class class2 : public class1
{ int x;
};
int main()
{ class2 obj;
  return 0;
}
```

Your answer

## Question 7

Q7) [1 mark] [CO2] Identify the error in following code(Fig 5). How can it be resolved?

Fig 5

<pre>template&lt;class P = int, class Q, class R = int, class S&gt; class DS2020 {     P p;     Q q;     R r;     S s; };</pre>	<pre>int main() {     DS2020&lt;char, char&gt; obj1;     DS2020&lt;int, int, int, int &gt; obj2;     cout&lt;&lt;sizeof(obj1)&lt;&lt;endl;     cout&lt;&lt;sizeof(obj2)&lt;&lt;endl;     return 0; }</pre>
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Your answer

## Question 8 and Question 9

Consider the code given in Figure 6 and answer Q8) and Q9) based on it.

Q8) [1 mark] Predict the output of the given code. (with one-two line explanation)

Q9) [1 mark] You have to modify the given code by changing only one or two statements in such a way that the output of the given code comes out to be: 12341213-4-3-2-1-3-1-2-1 (Note: You can't add or remove any *cout* statement. Just specify the line numbers in which you are making any modification.)

Fig 6	
<pre>1. class One { 2. public: 3.   One() 4.   { cout&lt;&lt;"1"; 5.   } 6.   ~One() 7.   { cout&lt;&lt;"-1"; 8.   } 9. }; 10. class Two: virtual public One { 11. public: 12.   Two() 13.   { cout&lt;&lt;"2"; 14.   } 15.   ~Two() 16.   { cout&lt;&lt;"-2"; 17.   } 18. }; 19. class Three: virtual public One { 20. public: 21.   Three() 22.   { cout&lt;&lt;"3"; 23.   } 24.   ~Three() 25.   { cout&lt;&lt;"-3"; 26.   } 27. };</pre>	<pre>28. class Four: public Two, Three { 29. public: 30.   Four() 31.   { cout&lt;&lt;"4"; 32.   } 33.   ~Four() 34.   { cout&lt;&lt;"-4"; 35.   } 36. }; 37. int main() 38. {   One *oneptr=new Four(); 39.     Two a; 40.     Three b; 41.     delete oneptr; 42.     return 0; 43. }</pre>

Your answer

## Question 10

Q10) [1 mark] [CO2] Is it possible to inherit from a template class? If yes, will the derived class also be generic? Justify.

Your answer

### Question 11

Q11) [3 marks] [CO3] Given an array `Student_List [n]` of size 'n' which contains objects of student class. Student class has following attributes: enrollment number (non-zero and unique), name and marks. The first 'm' student objects in `Student_List[]` are sorted according to enrollment numbers and remaining objects contain negative/null values in all attributes (representing no students details are stored there till now). **The value of 'm' is not known.** But it is given that  $m \ll n$  (m is very less than n). Now, given an enrollment number E, propose an efficient logic (write logic/pseudocode) to search and print the index of `Student_List[]` at which enrollment number E exists. If E does not exist in `Student_List[]` then return -1.  
[Expected time complexity:  $O(\log_2 m)$ ].

Your answer

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### Question 12

Q12) [4 marks] [CO2] A grocery shop stores various products (minimum zero and maximum unknown number of products) which are identified through product\_id, price, name, and manufacturing date. A product can be consumable or non consumable. A consumable product in addition to other attributes is also having an expiry date. Both manufacturing date and expiry date have attributes day, month and year. The grocery shop has a name, location and store ID. Minimum 5 customers are associated with each grocery store and each customer is identified by his name and address. The customers can be members & non-members. The members are having unique membership id while the non-members are having a unique mobile no. The discount calculation method on bills of customers and non-customers is different.

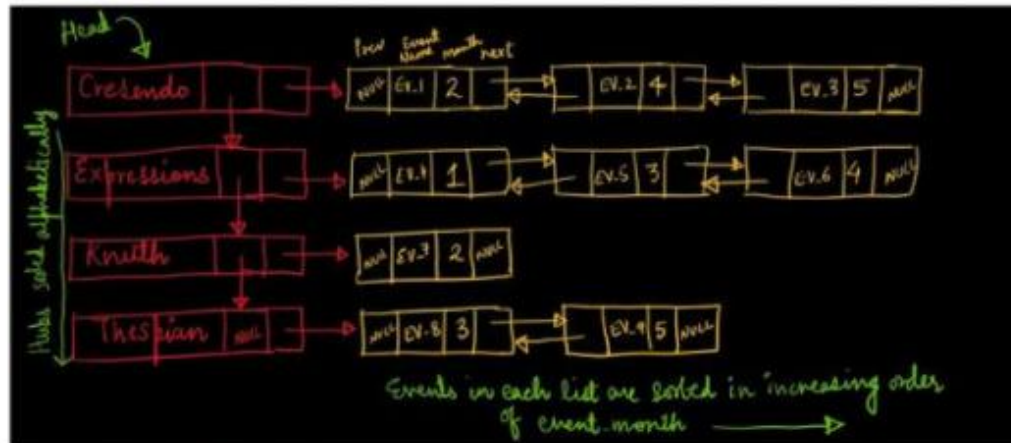
- [1.5 marks] Draw the complete class diagram showing relationships (along with multiplicity and roles) among classes for the above scenario.
- [2.5 marks] Implement the class diagram created in part a) in C++. (Write code for creating classes, their attributes, relationships among these classes, and mention virtual functions declaration or abstract classes where applicable). **You don't need to write definitions of the functions or main method.**

Your answer

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### Question 13

Q13) [3 marks] [CO1] There are various hubs in IIIT and in each hub various events takes place throughout the year. All the events occurring in different hubs in a particular year are stored in a list of lists Data Structure as shown below. The structure of two types of nodes in the shown list of lists is also given.



```
struct hub_node // shown in red
{
    String hub_name;
    hub_node *next_hub;
    event_node *head_event;
};
```

```
struct event_node //shown in yellow
{
    event_node *prev_event;
    String event_name;
    int event_month;
    event_node *next_event;
};
```

The Red nodes in figure represent hub\_node. The linked list of hub\_nodes is sorted alphabetically according to hub\_names. The head\_event pointer of each hub\_node points to the doubly linked list of events (shown in yellow nodes) occurring in that hub in a particular year. These events are stored in increasing order of the event\_month in which they occur.

Assume above list is created and "hub\_node \*head" is the head pointer pointing to first node of hub\_node list. Complete the following C++ function:

```
hub_node* insert_hub_event ( hub_node* head, String hub_name, String event_name, int event_month)
{
    // write the code in this function to insert a given event (event name and event month) of a particular
    hub (hub_name given) at correct place. If the hub_name doesnot exist already, add a new hub_node for
    the new hub and then insert the given event in that list.
}
```

Your answer