

T2 Examination, 2017
B.Tech II Semester

**Course Title: Software Development Fundamentals-2/Data Structures/
Object Oriented Programming**

Course Code: 15B11CI211/10B11CI211/10B11CI311

Maximum Time: 1 Hr

Maximum Marks: 20

Q1 [2 Marks]. Compute the value of the expression denoted by the expression tree as shown in figure 1, provided $A=10, B=5, C=3, D=4, E=1, F=2, G=1, H=5$.

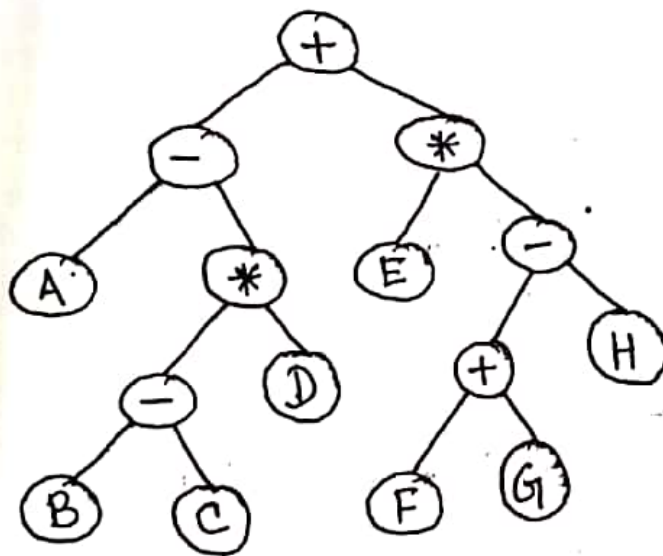


Figure: 1

Q2 [3 Marks]. A diagonal matrix is a matrix whose all elements are 'Zero' apart from those on the diagonal from upper left to lower right. An efficient way to store such a matrix is with the aid of Singly Linked List. What fraction of the original memory will be utilised for the representation of a 100×100 integer diagonal matrix using a Singly Linked List. Assume that an integer occupies 4 Bytes and a pointer to a node occupies 4

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Enroll No: _____

Jaypee Institute of Information Technology, Noida

T2 Examination-2019

B. Tech (CSE/IT/ECE) 2nd Semester

Course Title: Software Development Fundamental 2/
Object Oriented Programming
Course Codes: 15B11CI211/10B11CI311

Max Time: 1 Hr

Max Marks: 20

Consider a double ended circular queue which is initially empty. Following are the variable and functions used in queue operations. Initially front and rear is -1, and size of queue is 10. Consider the following given functions

`void insertFront(int value);` //function to insert value at the front of the queue

`void insertRear(int value);` //function to insert value at the rear of the queue

`void deleteFront();` //function to delete value from the front of the queue

`void deleteRear();` //function to delete value from the rear of the queue

What will be the state of the queue, and values of front and rear variables for given sequence:

`insertFront(3), insertFront(5), insertRear(7), insertFront(10), deleteFront(), deleteRear()`

- after end of four insert operations
- after end of all the operations

[5]

Tintin, Captain Haddock and Professor Calculus have developed a game where Tintin and Captain Haddock will respectively provide the in-order and pre-order traversal of a given tree. In order to solve this, Prof. Calculus would have to identify the name of a famous personality depicted in the tree. In order to solve this, Prof. Calculus would have to construct the tree first and utilize it to identify the name by traversing the tree in post-order. If the in-order and pre-order traversal provided by Tintin and Captain Haddock are T, D, E, N, R, U, K, L, A and R, N, E, A, K, U, L respectively, then construct the binary tree that will help Prof. Calculus guess the name of the famous personality hidden in it. Also identify the name predicted by Prof. Calculus.

Suppose for a certain programming language an integer occupies 4 bytes and a pointer occupies 8 bytes. You need to represent a 20x20 matrix having only 5% non-zero elements using a single linked list so that it consumes lesser amount of memory. What percent of the actual memory will be saved by this representation compared to the actual 2D representation of the array?

You are given a single linked list in which the node contains following data members: Author's name, Book title, BookId and page numbers. Write a program to

- insert a new node after a specific BookId. If the specified BookId is not present in the linked list then insert the new node at the beginning of the linked list.
- sort the linked list as per the BookId and display all books detail.

Q.1. [5 MARKS] In your D:\ drive, there are 3 files namely file1.txt, file2.txt and file3.txt. Files file1.txt and file2.txt have 10 integers stored already. In the file file3.txt, the least common multiple (LCM) of the i^{th} numbers of both the files (file1 and file2) were stored ($1 \leq i \leq 10$). (i.e. the first entry of file3.txt was the LCM corresponding to first number from file1.txt and first number from file2.txt...& so on). But due to some reasons, some entries of file3.txt got corrupted. You have to write a code in C which reads all the three files to determine if file3.txt entries are correct or not. The program should create another file file4.txt to store only YES or NO corresponding to each pair from File1.txt and File2.txt. Write YES (in File4.txt) if corresponding LCM entry in file3.txt is correct otherwise NO.

Q.2. [3 MARKS] WAP in C to find peak elements in an array of integers. The array element is peak if it is not smaller than its neighbours. For example in {5, 12, 17, 9}, 17 is peak element. In {6, 21, 15, 3, 27, 94, 57}, 21 and 94 are the peak elements. You have to pass array to a user defined function. In the function, access all elements using pointer notations. The peak elements must be displayed in main function.

Q.3. [2+2+3 MARKS] What are the outputs of the following codes? Justify. (Assume no compile time error).

A) void f(char**); // Assume sizeof(int)=4
main() { char *argv[] = { "ab", "cd", "ef", "gh", "ij", "kl" };
f(argv);
void f(char **p)
{ char *t;
t = (p += sizeof(int))[-1]; printf("%s\n", t);}

B) main() {
int a[][3] = {1, 2, 3, 4, 5, 6}; int (*ptr)[3] = a;
printf("%d %d", (*ptr)[1], (*ptr)[2]); ++ptr;
printf("%d %d\n", (*ptr)[1], (*ptr)[2]);}

C) void main() { int c, *b, **a;
c = 4;
b = &c;
a = &b;
printf("%d", f(c, b, a));

int f(int x, int *py, int **ppz)
{ int y, z;
**ppz += 1; z = **ppz;
*py += 2; y = *py; x += 3;
return x + y + z;

4. Create a class *ComplexNumber*, which contains two private data members real and imaginary. Write a C++ program to
- Include default and parameterized constructor in the *ComplexNumber* class to initialize the private data members.
 - Overload the + operator to return the sum of two *ComplexNumber* objects (define it as a member function).
 - Overload the * operator to return the multiplication of two *ComplexNumber* objects (define it as a friend function).
 - Define a member function *display()* that display the *ComplexNumber* objects in the following format: $a + ib$, where a is real part and b is the imaginary part of Complex Number object. Do not display the a or b terms if they have zero coefficients. Moreover, if any coefficient is negative it should be preceded by a minus sign, and not a plus sign. [CO6][8 M]
5. A University maintains its Academic Activity Calendar file *Date.txt* (date format: Day Month Year) which contains scheduled dates of various events such as workshops, seminars etc to be held in the campus. Write a C program using structures and functions to read data from *Date.txt* file.
- Validate the date and then print the date on screen. For example: if date fetched from the file is 30, 2, 2019 then that is an invalid date as February does not has 30 days.
 - Now ask user to enter a date for proposed workshop to be held and check for any clash with already entered dates in the file, if yes, then print "Date already booked for an event" otherwise print this date at the end of the file. [CO1][5 M]
6. What is the output of following codes? Justify your answer [CO3, CO5][5 M]

a) What is the output of following codes for given input Linked List: 3->5->9->2->7->1

```
void print (struct node* start)
{
    if(start==NULL)
        return;
    printf("%d", start->data);

    if(start->next !=NULL)
        print(start->next->next);
}
```

```
b) #include<iostream>
using namespace std;
class Base {
public:
    void fun()
    {
        cout<<"Base::fun() called";
    }
    void fun(int i)
    {
        cout<<"Base::fun(int i) called";
    }
}
```

```
temp=ptr->next;
ptr->next=temp->next;
free(temp); return; }
```

Q.3. [5 Marks] Write a **Non recursive** function to count the number of leaves in a binary tree using **Queue**. You do not have to write the code for creation of tree. Pass only the root to the function. Consider the definition of the node as used in Q.1.

Q.4. [2.5 Marks] What does the following function do for a given Linked List of integers? Discuss your answer if link list has even number of nodes as well as odd number of nodes.

```
void fun(struct node* head) //head is the address of the first node.
{
    if(head == NULL) return;
    printf("%d", head->data);
    if(head->next != NULL)
        fun(head->next->next);
    printf("%d", head->data); }
}
```

Q.5.[5 Marks] Given three link lists of integers (being pointed by head1, head2 and head3), write a function in C to find the triplets having one node from each list such that the sum of the values of the nodes is equal to a given number 'n'. For example if three link lists are 12->6->29 , 23->8->5 and 90->20->59; and n=101 then output should be triplet <6,5,90>. You do not have to write the code for link list creation. Only write the function having following prototype:

```
fun ( node * head1, node * head2, node * head3,int n)
```

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Similarly, Non-teaching employee has *department* as additional data member. [CO6][8 M]

Tasks:

- Write constructors to initialize the data members of classes (both base and derived).
- Write an array of objects of Teaching Employee and Non-teaching Employee. Display the non-teaching employee details with year of experience greater than 12.
- Write a member function in Teaching Employee class to update the grade from Associate to Professor if years of experience are more than 8.

Convert the In-fix expression: $2 + 5 * (3/4) + 7/9 - 8 * (6+1)$. [CO2][4 M]

Convert the given in-fix expression into post-fix expression using stack.

Perform step wise evaluation of post-fix expression computed in (a) using stack.

Distinguish between the following two statements. [CO5][2 M]

`Date d2=d1;`
`d2=d1;`
 where d1, d2 are objects of Date class.

What would be the result when the following code snippet will be executed? Also explain the output when the statement "*static Abc obj*" is marked as a comment. [CO5][3 M]

<pre> class Abc { int i; public: Abc() { cout << "Hi "; } ~Abc() { cout << "Bye"; } } </pre>	<pre> void f() { static Abc obj; cout<<"I am Static "; } main() { f(); } </pre>
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P.T.O.

Jaypee Institute of Information Technology, Noida**T1 Examination, 2017
B.Tech. II Semester****e Title : Software Development Fundamentals-2/Data Structures/
Object Oriented Programming****Maximum Time : 1 Hr.****e Code : 15B11CI211/10B11CI211/10B11CI311****Maximum Marks : 20****[3 Marks]** Find the output of the following C code and justify your answer:

```
int f(int *a, int n){
    if (n<=0)
        return 0;
    else if (*a%2 == 0)
        return *a + f(a+1, n-1);
    else
        return *a - f(a+1, n-1);}

main(){
    int a[]={12, 7, 13, 4, 11, 6};
    printf("%d", f(a,6));
    return 0;
}
```

[4 Marks] A new numeric system use the following operators along with other existing operators, with their precedence given below in the following table:

Operator	Precedence
~	Highest
#, \$, &	Medium
%, @	Lowest

Convert the following infix expression into corresponding postfix expression:

A @ (B # C & D % (E ~ F & G) % H) \$ I @ J**[5 Marks]** A file named "results.txt" contains details of students for SDF-2 course. The input file is in the following format: each line contains student's first name 'fname', then one space, mark of SDF-2 course, then one space, and enrollno of student. The data types of fname, mark, enrollno are string, integer and integer respectively. Write a C program to reorder the marks of the students in ascending order and write the sorted student details in a new file named "sortedresult.txt".**[8 Marks]** X and Y have recently developed interest in Computer Science and were arguing the versatility of stack and queue data structures. X claimed that stack is a more versatile data structure while Y argued for queue. However both argued upon the definition below: *Given two data structures A and B, the data structure A will be more versatile than data structure B provided that the behaviour of B can be programmed using one or more variables of type A.* Justify who among the two made the correct claim regarding stack and queue data structure with code and diagrams to support your answer.

- a. $[4 \times 2.5 = 10]$ marks] Find the output
 $\text{float } t[2][3] = \{ \{1, 1, 1, 2, 1, 3\} \{2, 1, 2, 2, 2, 3\} \};$
 What will be the output of
 $((*(t+1)+1)) + (*(t+1)+1)*1$

- b. The function rearrange is called with the list containing the integers 1, 2, 3, 4, 5, 6, 7 in the given order. What will be the final outcome after the function completes execution?

```
struct node {int value; struct node *next;};
void rearrange(struct node *list) {
    struct node *p, *q;
    int temp;
    if (!list || !list->next) return;
    p = list; q = list->next;
    while (q) {
        temp = p->value;
        p->value = q->value;
        q->value = temp;
        p = q->next;
        q = p ? p->next : 0;
    }
}
```

- c. Let A be a square matrix of size $n \times n$.
 $C = 100$

```
for i = 1 to n do
    for j = 1 to n do
        Temp = A[i][j] + C
        A[i][j] = A[j][i]
        A[j][i] = Temp - C
    }
```

```
for i = 1 to n do
    for j = 1 to n do
        cout << A[i][j];
```

```
d. #include <iostream>
using namespace std;
class A {
public:
    virtual void fun() {cout << "A" << endl; }
};
class B: public A {
public:
    virtual void fun() {cout << "B" << endl; }
};
class C: public B {
public:
    virtual void fun() {
        cout << "C" << endl; }
};
```

```
int m, att1;
A *a = new C;
A *b = new B;
a->fun();
b->fun();
return 0;
}
```

5. $[2 \times 2.5 = 5 \text{ marks}]$ Find the errors and

```
a. #include <iostream>
using namespace std;
class A {
public:
    void print() { cout << "A::print()"; }
};
class B: private A {
public:
    void print() { cout << "B::print()"; }
};
class C: public B {
public:
    void print() { A::print(); }
};
int main()
{
    C b;
    b.print();
}
```

```
b. #include <iostream>
using namespace std;
class base {
public:
    virtual void show() { cout << "In"
};
class derived: public base {
    int x;
public:
    void show() { cout << "In derived
        derived() { x = 10; }
        int getX() const { return x; }
};
```

```
int main() {
    derived d;
    base *bp = &d;
    bp->show();
    cout << bp->getX();
    return 0;
}
```


Q4 [8 Marks]. Define a class named 'Document' that contains a member variable of type string named 'text' that stores any textual content for the document. Create functions named 'getText' and 'setText' that gets and sets text field.

Define a class for 'Email' that is derived from 'Document' and that includes member variables for the sender, recipient, and title of an email message. Implement appropriate get and set functions. The body of the e-mail message should be stored in the inherited variable text.

Define a class for 'File' that is derived from 'Document' and that includes a member variable for the pathname. Implement appropriate get and set functions for the pathname.

Create several sample objects of type 'Email' and 'File' in main function to test the program. Also, write an appropriate function to search a keyword entered by user (in main) in Email/File.

Q5 [8 Marks]. Define a class named 'Complex' for complex numbers. A complex number is a number of the form: $a + b*i$,

where a and b are numbers of type double, and i is a number that represents the quantity $\sqrt{-1}$. Represent a complex number as two values of type double. Name the member variables real and imaginary. (The variable for the number that is multiplied by i is called as imaginary.) Include a constructor with two parameters of type double that can be used to set the member variables of an object to any values. Include a constructor that has only a single parameter of type double; call this parameter realPart and define the constructor so that the object will be initialized to realPart + 0*i. Include a default constructor that initializes an object to 0 (i.e. $0 + 0i$).

Overload all the following operators so that they correctly apply to the type Complex:

$=$, $+$, $-$, $*$.

Write a program to test all above cases in main function. The product of two complex numbers is given by the following formula:

$$(a + b*i)*(c + d*i) == (a*c - b*d) + (a*d + b*c)*i$$

```
t = (p += sizeof(int))[-1]; printf("%s\n", t);}
```

```
B) main() {
int a[][3] = {1, 2, 3, 4, 5, 6}; int (*ptr)[3] = a;
printf("%d %d ", (*ptr)[1], (*ptr)[2]); ++ptr;
printf("%d %d\n", (*ptr)[1], (*ptr)[2]);}
```

<pre>C) void main() { int c, *b, **a; c = 4; b = &c; a = &b; printf("%d ", f(c, b, a)); }</pre>	<pre>int f(int x, int *py, int **ppz) { int y, z; **ppz += 1; z = **ppz; *py += 2; y = *py; x += 3; return x + y + z; }</pre>
---	---

Q.4.[3 MARKS] The objective of the following code was to print the n^{th} Fibonacci number. One line from the code was removed. Write the missing line so that this code can achieve its objective.

<pre>int stack[100],i; int top=1; void push(int); int pop(int); void main() { int a1,a2,n; printf("enter no"); scanf("%d",&n); n=n-1; stack[0]=0; stack[1]=1;</pre>	<pre>for(i=0;i<n;i++) { push(stack[i]); push(stack[i+1]); a1=pop(top); a2=pop(top); MISSING LINE; } printf("%d",stack[top]);}</pre>	<pre>int pop(int a) {int c; c=stack[top]; top--; return c;} void push(int a) {top++; stack[top]=a;}</pre>
--	--	--

Q.5. [2 MARKS] Sort {5, 8, 1, 9, 3, 2} using selection sort. Show all intermediate steps.

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POSSESSION OF MOBILE IN EXAM IS UFM PRACTICE

Jaypee Institute of Information Technology, Noida
Enroll No: _____
End Term Examination-2019
B. Tech (CSE/IT/ECE) 2nd Semester

Title: Software Development Fundamental 2
Oriented Programming
Codes: 15B11CI211/10B11CI311

Max Time: 2 Hr
Max Marks: 35

Develop C programs using structures, pointers, functions, and files.
Solve problems related to data storage, retrieval, searching, and sorting by utilizing stack/queue.
Use of linked list to solve various problems.
Use binary tree data structure to perform operations like searching, insertion, deletion, and traversing.
Explain basic features of object-oriented design such as objects, classes, encapsulation, polymorphism, inheritance, and abstraction.
Design C++ programs using OOPs concepts like encapsulation, Inheritance, Polymorphism, and Standard Template Library.

Write a C++ program for university management systems. The university management system has two different types of Employee: Teaching Employee and Non-Teaching Employee. Employee class contains data members as *employee id*, *name*, *year of experience* and *address*. Teaching Employee has two additional data members: *specialization* (CSE, ECE, BIO, IT) and *grade* (Assistant, Associate, Professor). Similarly, Non-teaching employee has *department* as additional data member. [CO6][8 M]

Perform the following tasks:
1. Define constructors to initialize the data members of classes (both base and derived).
2. Create an array of objects of Teaching Employee and Non-teaching Employee. Display the non-teaching employee details with year of experience greater than 12.
3. Write a function in Teaching Employee class to update the grade from Associate to

Jaypee Institute of Information Technology, New Delhi
End Term Examination, May 2016
B.Tech, Semester-II

Course Title: SDF-II/Data Structures/OOP Programming
Course Code: 15B11CI211/10B11CI211/10B11CI311

Max. Time: 2 hours

Max Marks: 35

[10 Marks]

Consider the following declarations of a class Linked List and main function.

```
struct Node {
    int x;
    Node *next;
};

class LinkedList {
    Node* head;
public:
    LinkedList(); // to assign null value to header node
    void add(int); // function to add node in the beginning of link list
    void sort(); // function to sort link list
    LinkedList operator +(LinkedList); // operator function to merge two sorted link lists into a single sorted link list
    void show(); // display linked list
};

void main ()
{
    LinkedList L1,L2;
    L1.add(9); L1.add(5); L1.add(2);
    L2.add(1); L2.add(10);
    L1.sort(); L2.sort();
    LinkedList L3=L1+L2;
    L3.show();
}
```

Give the definitions of all functions declared in the class including constructor so that main function is executed without any error.

4. Create a class *ComplexNumber*, which contains two private data members.
- Include default and parameterized constructor in the *ComplexNumber* class to initialize the private data members.
 - Overload the $+$ operator to return the sum of two *ComplexNumber* objects (define it as a member function).
 - Overload the $*$ operator to return the multiplication of two *ComplexNumber* objects (define it as a friend function).
 - Define a member function `display()` that display the *ComplexNumber* objects in the following format: $a + ib$, where a is real part and b is the imaginary part of Complex Number object. Do not display the a or b terms if they have zero coefficients. Moreover, if any coefficient is negative, it should be preceded by a minus sign, and not a plus sign. [CO6]

A University maintains its Academic Activity Calendar file *Date.txt* (date format: Day Month Year) which contains scheduled dates of various events such as workshops, seminars etc to be held on campus. Write a C program using structures and functions to read data from *Date.txt* file.

- Validate the date and then print the date on screen. For example: if date fetched from the file is 2, 2019 then that is an invalid date as February does not have 30 days.
- Now ask user to enter a date for proposed workshop to be held and check for any clash with already entered dates in the file, if yes, then print "Date already booked for an event" otherwise print this date at the end of the file. [CO1]

[CO3, CO5]

What is the output of following codes? Justify your answer

- a) What is the output of following codes for given input Linked List: 3->5->9->2->7->1

```
void print (struct node* start)
{
    if(start==NULL)
        return;
    printf("%d", start->data);

    if(start->next !=NULL)
        print(start->next->next);
    printf("%d", start->data);
}
```

```
b) #include<iostream>
using namespace std;
class Base {
public:
    void fun()
    {
        cout<<"Base::fun() called";
    }
    void fun(int i)
    {
        cout<<"Base::fun(int i) called";
    }
};
class Derived: public Base
{
public:
    int fun()
    {
        cout<<"Derived::fun() called";
    }
    void show()
    {
        fun();
    }
};
int main()
{
    Derived d;
    d.fun();
    d.show();
    return 0;
}
```

Information Technology, Noida

End Term Examination, 2017
B.Tech. II Semester

**Course Title: Software Development Fundamentals-2/Data Structures/
Object Oriented Programming**
Course Code: 15B11CI211/10B11CI211/10B11CI311

Maximum Time: 2 Hrs

Maximum Marks: 35

- Q1[6 Marks]** Write a delete function in C language for Singly Linked List with integer data that deletes the first occurrence of a given integer from the list and returns the resulting list.
- Q2[7 Marks]** Write a C function that read decimal numbers from a file and convert them to hexadecimal numbers using stack. Assume stack operations are defined, do not write code for stack operations rather call appropriate functions.
- Q3[6 Marks]** Define a class named PrimeN that stores a prime number. The default constructor should set the prime number to 2. Add another constructor that allows the caller to set the prime number. Also, add a function to get the prime number.
Overload the prefix and postfix ++ and -- operators so that it returns a PrimeN object that is the next largest prime number (for ++) and the next smallest prime number (for --). For example, if the object's prime number is set to 13, then invoking ++ should return PrimeN object whose prime number is set to 17. Create an appropriate main function to test this program.
- Q4 [8 Marks]** Define a class named 'Document' that contains a member variable of type string named 'text' that stores any textual content for the document. Create functions named 'getText' and 'setText' that gets and sets text field.
Define a class for 'Email' that is derived from 'Document' and that includes member variables for the sender, recipient, and title of an email message. Implement appropriate get and set functions. The body of the e-mail message should be stored in the inherited variable text.
Define a class for 'File' that is derived from 'Document' and that includes a member variable for the pathname. Implement appropriate get and set functions for the pathname.
Create several sample objects of type 'Email' and 'File' in main function to test the program. Also, write an appropriate function to search a keyword entered by user (in main) in Email/File.

display the a or b terms if they should be preceded by a minus sign, and not a plus sign.

5. A University maintains its Academic Activity Calendar file *Date.txt* (date format: Day Month Year) which contains scheduled dates of various events such as workshops, seminars etc to be held in the campus. Write a C program using structures and functions to read data from *Date.txt* file.
- a) Validate the date and then print the date on screen. For example: if date fetched from the file is 30/2, 2019 then that is an invalid date as February does not have 30 days.
- b) Now ask user to enter a date for proposed workshop to be held and check for any clash with already entered dates in the file, if yes, then print "Date already booked for an event" otherwise print this date at the end of the file.

[CO1][5 M]

[CO3, CO5][5 M]

6. What is the output of following codes? Justify your answer

a) What is the output of following codes for given input Linked List: 3->5->9->2->7->1

```
void print (struct node* start)
{
    if(start==NULL)
        return;
    printf("%d", start->data);

    if(start->next !=NULL)
        print(start->next->next);
    printf("%d", start->data);
}
```

```
b) #include<iostream>
using namespace std;
class Base {
public:
    void fun()
    {
        cout<<"Base::fun() called";
    }
    void fun(int i)
    {
        cout<<"Base::fun(int i) called";
    }
};
class Derived: public Base
{
public:
    int fun()
    {
        cout<<"Derived::fun() called";
    }
    void show()
    {
        fun();
    }
};
int main()
{
    Derived d;
    d.fun();
    d.show();
    return 0;
}
```

from upper left to lower right.
What fraction of the original memory will be utilised for the representation of a 100×100 integer diagonal matrix using a Singly Linked List. Assume that an integer occupies 4 Bytes and a pointer to a node occupies 4 Bytes.

Q3 [6 Marks]. A Singly Linked List consists of class (1, 2, ..., 12) and class monitor name. The data types of class and monitor name are integer and string respectively. In order to organise an event, the school wants to rearrange this data on the basis of class so that all odd class monitors precede all even class monitors. This data will be represented by a Singly Linked List. Take the assumption that the student's detail is also rearranged when rearrangement is done on the basis of class and there is only 1 monitor per class. Write a C program to implement this concept.

For example: Sample Input: $1 \rightarrow 2 \rightarrow 3 \rightarrow 4 \rightarrow 5 \rightarrow \text{null}$, where 1, 2, ..., etc represents class

Sample Output: $1 \rightarrow 3 \rightarrow 5 \rightarrow 2 \rightarrow 4 \rightarrow \text{null}$

Q4 [3+6 Marks]. The in-order and level-order traversal of a binary tree is given below:

In-order: 80, 30, 150, 120, 40, 90, 110, 10, 50, 100, 130, 60, 140, 20, 70.

Level-order: 10, 40, 20, 80, 90, 50, 70, 30, 110, 60, 120, 100, 140, 150, 130.

Take the assumption that a binary tree is not necessarily a full or complete binary tree.

- Construct a binary tree from the above two sequences.
- Write an appropriate C function to solve the problem as discussed in part (a).

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POSSESSION OF MOBILE IN EXAM IS UFM PRACTICE

Name: _____

Enroll No: _____

Jaypee Institute of Information Technology, Noida

End Term Examination-2019

B. Tech (CSE/IT/ECE) 2nd Semester

Course Title: Software Development Fundamental 2

Object Oriented Programming

Course Codes: 15B11CI211/10B11CI311

Max Time: 2 Hr

Max Marks: 35

- 1) Develop C programs using structures, pointers, functions, and files.
- 2) Solve problems related to data storage, retrieval, searching, and sorting by utilizing stack/queue.
- 3) Make use of linked list to solve various problems.
- 4) Apply binary tree data structure to perform operations like searching, insertion, deletion, and traversing.
- 5) Explain basic features of object-oriented design such as objects, classes, encapsulation, polymorphism, inheritance, and abstraction.
- 6) Develop C++ programs using OOPs concepts like encapsulation, Inheritance, Polymorphism, and Standard Template Library.

Write a C++ program for university management systems. The university management system has two different types of *Employee*: *Teaching Employee* and *Non-Teaching Employee*. *Employee* class contains data members as *employee id*, *name*, *year of experience* and *address*. *Teaching Employee* has two additional data members: *specialization* (CSE, ECE, BIO, IT) and *grade* (Assistant Associate, Professor). Similarly, *Non-teaching employee* has *department* as additional data member. Perform the following tasks: [CO6][8 M]

- a) Define constructors to initialize the data members of classes (both base and derived).
- b) Create an array of objects of *Teaching Employee* and *Non-teaching Employee*. Display the non-teaching employee details with year of experience greater than 12.
- c) Write a member function in *Teaching Employee* class to update the grade from Assistant Professor if years of experience are more than 8.

Consider the In-fix expression: $2 + 5 * (3/4) + 7/9 - 8 * (6+1)$. [CO2][4 M]

- a) Convert the given in-fix expression into post-fix expression using stack.
- b) Perform step wise evaluation of post-fix expression computed in (a) using stack.

- a) Distinguish between the following two statements. [CO5][4 M]

Date d2=d1;

d2=d1;

where d1, d2 are objects of Date class.

- b) What would be the result when the following code snippet will be executed? Also explain the output when the statement "*static Abc obj*" is marked as a comment. [CO5][4 M]

```
class Abc
{
    int i;
public:
    Abc()
    {   cout << "Hi ";   }

    ~Abc()
    {   cout << "Bye";   }
};
```

```
void f()
{
    static Abc obj;
    cout << "I am Static ";
}

main()
{
    f();
}
```


POSSESSION OF MOBILE PHONES IN EXAMINATION IS UFM PRACTICE

Name:

JAYPEE INSTITUTE OF INFORMATION TECHNOLOGY, NOIDA

Roll No.

T2 Examination, April-2016

Course Title: Software Development Fundamentals-II
/ Object Oriented Programming / Data Structures

Max. Time: 60 Min

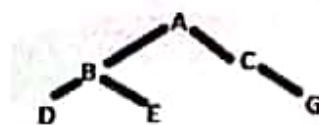
Course Code: 15B11CI211/10B11CI311/10B11CI211

Max. Marks: 20

Q.1.[5 Marks] Assume a binary tree is already created using the following node definition:

```
struct node { struct node * left; int value; struct node * right;};
```

(You do not have to write the code for creation of tree). Write a function in C to display the contents of the tree in the level order. i.e. if following is the tree, the level order search will be: A, B, C, D, E, null, G. Use of appropriate data structures.



Q.2.[2.5 Marks] Following function deletes a node from a circular link list whose data matches with user entered value 'x'. Identify a missing line 1 in the code given below:

```
// Assume : typedef struct Node { int data; struct Node *next; } node;
void Delete_CL (node *ptr, int x) // ptr is pointing to the first node of the link list
{ node *head=ptr;
  while (-----MISSING LINE (1)-----)
    ptr=ptr->next;
  if (ptr->next==head)
  {   printf ("not found");   return; }
  temp=ptr->next;
  ptr->next=temp->next;
  free(temp); return; }
```

```

L1.add(1); L2.add(10);
L1.sort(); L2.sort();
LinkedList L3=L1+L2;
L3.show();
}

```

Give the definitions of all functions declared in the class including constructor so that main function is executed without any error.

2. [7 Marks] A book shop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book, the sales person inputs the title and author and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed. If it is, then the system displays the book details and requests for the number of copies required. If the requested copies are available, the total cost of the requested copies is displayed; otherwise the message "Requested copies not in the stock" is displayed.

Design a system using a class called books with suitable member functions and constructors. Use new operator in constructors to allocate memory space required.

Also:

- The price of the books should be updated as when required. Use a private member function to implement it.
- The stock value of each book should be automatically updated as soon as a book is added or sold.

3. [3 Marks] Construct a binary tree, whose In order and pre order traversals are as follows:

InOrder: DBEFACHG

Pre Order: ABDEF CGH

Course Title: Software Development Fundamental 2/
Data Structures/ Object Oriented Programming
Course Codes: 15B11CI211/10B11CI211/10B11CI311

Max Time
Max Marks

1. Consider the array $A[] = \{6, 7, 8, 9, 2, 11, 1, 5, 4\}$. Apply bubble sort to arrange the array in order. What is the total cost of the bubble sort when element 6 reaches its correct position in the array? The cost associated with each swap is 20 rupees.
2. An organization wants to process the details of employees in a file. For that, define "Employee" with fields: id, name, and age. write a complete program to perform the operations:
 - a) Create an array of n employees dynamically and input their details from user.
 - b) Fetch data from array of employees and write into a file "EmployeeDetails.txt".
 - c) Read the details from file "EmployeeDetails.txt" and display details of employee whose age > 55.

Given three stacks S1, S2, S3 (not necessarily of equal sizes) represented as arrays containing integers. The first index of the array represents the top element of the stack. Write a function to find the maximum possible sum which is equal for all three stacks by removing the top elements. For Example:

Input: $S1 = \{3, 2, 4, 1\}$, $S2 = \{4, 2, 5\}$, $S3 = \{1, 5, 3, 4\}$

Output: Maximum possible sum = 7

Explanation: If we remove 3 from S1, 4 from S2 and {1, 5} from S3, all the three stack sums are equal to 7. Assume the elements are already present in three stacks.

What would be the output of the following codes. Give proper justification.

[2.]

```
a) #include <stdio.h>
void swap (char *a, char *b)
{
    char *t = a;
    a = b;
    b = t;
}
int main()
{
    char *a = "JIITNoida";
    char *b = "Sector62";
    char *t;
    swap(a, b);
    printf("(%s, %s)", a, b);
    t = a;
    a = b;
    b = t;
    printf("\n(%s, %s)", a, b);
    return 0;
}
```

```
b) #include <stdio.h>
int x;
void F2 (int z)
{
    z += x;
    printf("%d ", z);
}
void F1 (int *y)
{
    int x = *y + 2;
    F2 (x);
    *y = x - 1;
    printf("%d ", x);
}
void main()
{
    x = 5;
    F1(&x);
    printf("%d ", x);
}
```