

Q1.

**CLO-02: Implement linked lists and pass them to and from functions.****[10+10=20 Marks]**

Write a program that takes only the binary data from the user, Suppose the linked list has already been produced on the basis of that data, where binary data is stored in "info" and next pointer is pointing to next node.

```
struct node
{
    int info;
    node *next;
} *head=NULL;
```

Write the code for the implementation of following XOR function on each node by taking the XOR of the values of previous node->info and the next node->info. Create a function that is creating a new linked list on the basis of the output of the XOR function.

XOR function			
previous node	next node	XOR output	Linked list on the basis of XOR output
0	0	0	Don't add this node in the new linked list
0	1	1	Add this node in the new linked list
1	0	1	Add this node in the new linked list
1	1	0	Don't add this node in the new linked list

Consider head pointer=1 and End of the linked list NULL pointer =0.

Input Linked list = 1->0->0->1->1->1->0->0

XOR output = 1->1->1->1->0->1->1->0->0

New linked list = 1->1->1->1->1->1

Q2.

**CLO-02: Implement linked lists and pass them to and from functions.****[5+5+10= 20 Marks]**

a) Write the output of the following code

```
int num;
int *listPtr;
int *temp;
int a[5];
listPtr = a;
num = 8;
temp = listPtr;
for (int j = 0; j < 5; j++)
{
    *listPtr = num;
    num = num + 2;
    listPtr++;
}
listPtr = temp;
for (int k = 0; k < 5; k++)
{
    *temp = *temp + 3;
    temp++;
}
for (int k = 0; k < 5; k++)
{
    cout << *listPtr << " ";
    listPtr++;
}
cout << endl;
```

b) Explain, what does the function func() is responsible for?

```
int func(char* S)
{
    int x;
    for(x=0; *S != '\0'; x++)
    { S++; }
    return x;
}
```

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c) Given below is a main function, which you need to use in your program without any change. No global variables are allowed. Implement the two functions as defined below

```
int main()
```

c) Given below is a main function, which you need to use in your program without any change. No global variables are allowed. Implement the two functions as defined below

```
int main()
{
    char *name = getName()
    printName(name)
}
```

Implement the functions `getName()` and `printName()`.  
`getName()` should take input a name from the user, stores it into some space of suitable type, and return it as evident from the main as well  
 After getting the name, make another function `printName()` with suitable parameter type, and no return type, which should just print the name on screen.

**Q3.**

**CLO3: Demonstrate writing/reading data structures to/from binary/text files.**

[5+5+5+5= 20 Marks]

Due to COVID-19, only one flight is scheduled on this weekend from ISB to KHI Airport with very few seats available. The seat reservation plan is shared with you in a text file "COVID-19 Air Seat Reservation.txt" shown below. Where X is placed in front of the seat that is already been reserved. Like 1A, 2B and 4C has been reserved. While 1B, 2A, 4B all are available

```
1 X B C D
2 A X C D
3 A B C D
4 A B X D
5 A B C D
6 A B C D
7 A B C D
```

- Read the data from the file and store it in a structure `Seat_Reservation`. The data fields of the structure are `seat_No` and `occupancy`.
- Print all the seat reservation status to the user.

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- Make a function to ask from the user if he wants to reserve any seat. If the seat is available, reserve it for the user and update the seating plan accordingly.
- Also write the updated seating plan on the given file.

**Q4.**

**CLO4: Demonstrate basic object oriented programming (OOP) concepts (member data, member function, constructor, destructor, instantiation, initializer list), relationships among classes (inheritance, aggregation, composition) and access specifiers (private, public, protected).**

[5+5+10=20 Marks]

- Given the two classes `Person` and `Bank Account`



Write down the class definitions of above classes along with composition. Write a display member function, which should print the `Person`'s info and its account details.

- Define a base class `Person` with at least three data members (no `Bank Account` class in this case). Derive classes `Student` and `Faculty` from the `Person` class. Declare at least two data members for each derived class.
  - Define parameterized constructor for each class

d) Also write the updated seating plan on the given file.

**Q4.**

**CLO4: Demonstrate basic object oriented programming (OOP) concepts (member data, member function, constructor, destructor, instantiation, initializer list), relationships among classes (inheritance, aggregation, composition) and access specifiers (private, public, protected).**

**[5+5+10=20 Marks]**

a. Given the two classes Person and Bank Account



Write down the class definitions of above classes along with composition. Write a display member function, which should print the Person's info and its account details.

b. Define a base class **Person** with at least three data members (no Bank Account class in this case). Derive classes **Student** and **Faculty** from the Person class. Declare at least two data members for each derived class.

- Define parameterized constructor for each class
- Define a Display function in each class to print data members.

c. To store data related to students and courses, create just two classes Student and Course. Class Student should have Name, Roll# and cgpa, while courseCode, Title and CreditHrs should be the members of the Course class. These two classes are associated with each other as either:

Student takes courses

Or course have students

Implement the above association, and save the data of two students in this program.

You may create other function(s) as per requirement.

```

    drug();
    void enterdrugdetails();
    void showdrugdetails();
};
class Tablet : public Drug
{
protected:
    char tablet_name[30];
    char Volume_label[20];
public:
    float Price;
    Tablet();
    void entertabletetails();
    void showtabletetails ();
};
class PainReliever : public Tablet
{
    int Dosage_units;
    char Side_effects[20];
    int Use_within_days;
public:
    PainReliever();
    void enterdetails();
    void showdetails();
};

```

Answer the questions (i) to (iv) based on the following code:

- How many bytes will be required by an object of class Drug and an object of class Pain Reliever respectively (padding included)?
- Write names of all the data members which are accessible from the object of class Pain Reliever.
- Write names of all the members accessible from member functions of class Tablet.
- Write names of all the member functions which are accessible from objects of class Pain Reliever.

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Q6.

**CLOS: Demonstrate advanced OOP concepts; overloading (constructor, basic, stream and conversion operators), and polymorphism (virtual destructors and functions) through writing fully functional OOP codes.**

[2+4+7+7 =20 Marks]

- Implement all the functions of class Car as defined below

```

class Car
{
    string make; //company of the car
    int year; //year of the manufacturing
    int seating_capacity;
    int engine_power; //600cc or 1000cc

public:
    // constructor with default parameters
    car();
    car(int y, string m, int s, int e);
    get_data();
    set_data();
};

```

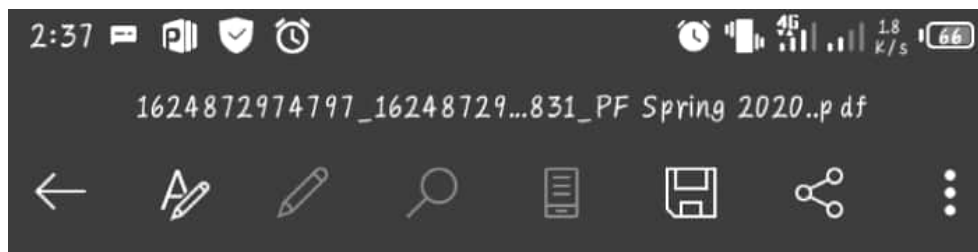
- For the class Car, overload the following operators as per provided description.

**<< Operator**

This should print the contents of Car object

**< operator**

This operator will be used to compare two Car objects. This should return True, if engine\_power and seating capacity of 1<sup>st</sup> car is less than 2<sup>nd</sup> one, else return false.



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Q6.

**CLO5: Demonstrate advanced OOP concepts; overloading (constructor, basic, stream and conversion operators), and polymorphism (virtual destructors and functions) through writing fully functional OOP codes.**

**[2+4+7+7 = 20 Marks]**

- a. Implement all the functions of class Car as defined below

```
class Car
{
    string make; //company of the car
    int year; //year of the manufacturing
    int seating_capacity;
    int engine_power; //600cc or 1000cc

public:
    // constructor with default parameters
    car();
    car(int y, string m, int s, int e);
    get_data();
    set_data();
};
```

- b. For the class Car, overload the following operators as per provided description.

**<< Operator**

This should print the contents of Car object

**< operator**

This operator will be used to compare two Car objects. This should return True, if engine\_power and seating capacity of 1<sup>st</sup> car is less than 2<sup>nd</sup> one, else return false.

- c. Why we have to overload the assignment operator for the link list class? Write down the function definition for overloading the assignment operator for the FloatList class. You may assume the following member functions already implemented, and can be used.  
Member Functions: Append(float), AddAtFront(float), Delete(float), DeleteAll()
- d. Write a template function max( ), which accepts an array and its size and returns the largest value in the array. The template function should be able to work with any type of data. Write a supporting main function as well to demonstrate the use of max function with at least two different types of data.

THE END  
Good Luck!

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