## Instructions:

i. All Questions are Compulsory.

ii. Programming Language : Section – A : C++

iii. Programming Language : Section – B : Python

iv. Answer either Section A or B and Section C is compulsory

### Section – A

<table>
<thead>
<tr>
<th></th>
<th>(a) Explain conditional operator with suitable example?</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(b) Which C++ header file(s) are essentially required to be included to run/execute the following C++ code :</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>void main()</td>
<td></td>
</tr>
<tr>
<td></td>
<td>{</td>
<td></td>
</tr>
<tr>
<td></td>
<td>char *word1=&quot;Hello&quot;,*word2=&quot;Friends&quot;;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>strcat(word1,word2);</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cout&lt;&lt;word1;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>}</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(c) Rewrite the following program after removing the syntactical errors (if any). Underline each correction.</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>#include&lt;conio.h&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#include&lt;iostream.h&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#include&lt;string.h&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>#include&lt;stdio.h&gt;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>class product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>{</td>
<td></td>
</tr>
<tr>
<td></td>
<td>int product_code,qty,price;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>char name[20];</td>
<td></td>
</tr>
<tr>
<td></td>
<td>public:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>product(){</td>
<td></td>
</tr>
<tr>
<td></td>
<td>product_code=0;qty=0;price=0;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>name=NULL;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>}</td>
<td></td>
</tr>
<tr>
<td></td>
<td>void entry()</td>
<td></td>
</tr>
<tr>
<td></td>
<td>{</td>
<td></td>
</tr>
</tbody>
</table>
cout<"\n Enter code,qty,price";
cin>>product_code>>qty>>price;
gets(name);
}
void tot_price() {return qty*price;}
};
void main()
{
p product;
p.entry();
cout<<tot_price();
}

(d) Write the output of the following C++ program code:
Note: Assume all required header files are already being included in
the program.
void change(int *s)
{
    for(int i=0;i<4;i++)
    {
        if(*s<40)
        {
            if(*s%2==0)
            {*s=*s+10;
            }else
            {*s=*s+11;
            }
        }
        else
        {
            if(*s%2==0)
            {*s=*s-10;
            }else
            {*s=*s-11;
            }
        }
        cout<"*s<" "
        s++;
    }
}
void main()
{
Write the output of the following C++ program code:

```cpp
class seminar {
    char topic[30];
    int charges;
public:
    seminar() {
        strcpy(topic,"Registration");
        charges=5000;
    }
    seminar(char t[]) {
        strcpy(topic,t);
        charges=5000;
    }
    seminar(int c) {
        strcpy(topic,"Registration with Discount");
        charges=5000-c;
    }
    void regis(char t[],int c) {
        strcpy(topic,t);
        charges=charges+c;
    }
    void regis(int c=2000) {
        charges=charges+c;
    }
    void subject(char t[],int c) {
        strcpy(topic,t);
        charges=charges+c;
    }
};
```
```cpp
}  
void show()
{
    cout<<topic<<" @"<<charges<<endl;
}
};

void main()
{
    seminar s1,s2(1000),s3("Genetic Mutation"),s4;
    s1.show();
    s2.show();
    s1.subject("ICT",2000);
    s1.show();
    s2.regis("Cyber Crime",2500);
    s2.show();
    s3.regis();
    s3.show();
    s4=s2;
    s4.show();
    getch();
}

Observe the following program carefully and attempt the given questions:
#include<iostream.h>
#include<conio.h>
#include<stdlib.h>
void main()
{
    clrscr();
    randomize();
    char courses[][10]={"M.Tech","MCA","MBA","B.Tech"};
    int ch;
    for(int i=1;i<=3;i++)
    {
        ch=random(i)+1;
        cout<<courses[ch]<<"\t";
    }
    getch();
}  
```
I. Out of all the four courses stored in the variable courses, which course will never be displayed in the output and which course will always be displayed at first in the output?

II. Mention the minimum and the maximum value assigned to the variable ch.

<table>
<thead>
<tr>
<th>I. What is Function 1 referred as? When will it be executed?</th>
<th>II. Write suitable C++ statement to invoke Function 2.</th>
</tr>
</thead>
</table>

(a) What do you understand by Function overloading or Functional polymorphism? Explain with suitable example.

(b) Answer the questions(i) and (ii) after going through the following class:

```cpp
class planet
{
    char name[20]; char distance[20];

public:
    planet()                                  //Function 1
    {
        strcpy(name, "Venus");
        strcpy(distance,"38 million km");
    }
    void display(char na[],char d[])       //Function 2
    {
        cout<<na<<" has "<<d<<" distance from Earth"<<endl;
    }
    planet(char na[], char d[])      //Function 3
    {
        strcpy(name,na);
        strcpy(distance,d);
    }
~planet()                                            //Function 4
    {
        cout<<"Planetarium time over!!!"<<endl;
    }
};
```

(c) Define a class DanceAcademy in C++ with following description:

- Private Members
  - Enrollno of type int

<table>
<thead>
<tr>
<th>(c) Define a class DanceAcademy in C++ with following description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Members</td>
</tr>
<tr>
<td>● Enrollno of type int</td>
</tr>
</tbody>
</table>
• Name of type string
• Style of type string
• Fee of type float
• A member function chkfee( ) to assign the value of fee variable according to the style entered by the user according to the criteria as given below:

<table>
<thead>
<tr>
<th>Style</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classical</td>
<td>10000</td>
</tr>
<tr>
<td>Western</td>
<td>8000</td>
</tr>
<tr>
<td>Freestyle</td>
<td>11000</td>
</tr>
</tbody>
</table>

Public Members
• A function enrollment() to allow users to enter values for EnrollNo, Name, Style and call function chkfee() to assign value of fee variable according to the Style entered by the user.
• A function display() to allow users to view the details of all the data members.

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

class indoor_sports
{
    int i_id;
    char i_name[20];
    char i_coach[20];
    protected:
    int i_rank,i_fee;
    void get_ifee();
    public:
    indoor_sports();
    void iEntry();
    void ishow();
};
class outdoor_sports
{
    int o_id;
    char o_name[20];
```cpp
char o_coach[20];
protected:
    int orank, ofee;
    void get_ofee();
public:
    outdoor_sports();
    void oEntry();
    void oshow();
};
class sports:public indoor_sports, protected outdoor_sports
{
    char rules[20];
    public:
        sports();
        void registration();
        void showdata();
};
```

(i) Name the type of inheritance illustrated in the above C++ code.

(ii) Write the names of all the members, which are accessible from the objects belonging to class outdoor_sports.

(iii) Write the names of all the member functions, which are accessible from the member function of class sports.

(iv) What will be the size of the object belonging to class indoor_sports?

3 (a) Write the definition of a function grace_score (int score [], int size) in C++, which should check all the elements of the array and give an increase of 5 to those scores which are less than 40.

Example: if an array of seven integers is as follows:

45, 35, 85, 80, 33, 27, 90

After executing the function, the array content should be changed as follows:

45, 40, 85, 80, 38, 32, 90

(b) An array P[30][20] is stored along the column in the memory with each element requiring 2 bytes of storage. If the base address of the array P is 26500, find out the location of P[20][10].

3
(c) Write the definition of a member function push() for a class Library in C++
to insert a book information in a dynamically allocated stack of books
considering the following code is already written as a part of the program:

```c++
struct book
{
  int bookid;
  char bookname[20];
  book *next;
};
class Library
{
  book *top;
public:
  Library()
  {
    top=NULL;
  }
  void push();
  void pop();
  void disp();
  ~Library();
};
```

(d) Write a user-defined function swap_row(int ARR[][3],int R,int C) in C++
to swap the first row values with the last row values:

For example if the content of the array is:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>30</td>
</tr>
<tr>
<td>40</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>70</td>
<td>80</td>
<td>90</td>
</tr>
</tbody>
</table>

Then after function call, the content of the array should be:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>90</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>(e)</td>
<td>Evaluate the following POSTFIX expression. Show the status of Stack after execution of each operation separately: 45, 45, +, 32, 20, 10, /, -, *</td>
</tr>
</tbody>
</table>
| 4  | (a) Find the output of the following C++ code considering that the binary file sp.dat already exists on the hard disk with 2 records in it.  
class sports  
{  
    int id;  
    char sname[20];  
    char coach[20];  
    public:  
    void entry();  
    void show();  
    void writing();  
    void reading();  
};

    void sports::reading()  
    {  
    ifstream i;  
    i.open("sp.dat");  
    while(1)  
    {  
    i.read((char*)&s,sizeof(s));  
    if(i.eof())  
    break;  
    else  
    cout<<"\n"<<i.tellg();  
    }  
    i.close();  
}  
void main()  
{  
    s.reading();  
}  | 1 |
|   | (b) Write a user defined function word_count() in C++ to count how many words are present in a text file named “opinion.txt”. | 2 |
For example, if the file opinion.txt contains following text:

Co-education system is necessary for a balanced society. With co-education system, Girls and Boys may develop a feeling of mutual respect towards each other.

The function should display the following:
Total number of words present in the text file are: 24

(c) Write a function display() in C++ to display all the students who have got a distinction(scored percentage more than or equal to 75) from a binary file “stud.dat”, assuming the binary file is containing the objects of the following class:

```cpp
class student
{
    int rno;
    char name[20];
    int percent;
    public:
    int retpercent()
    {
        return percent;
    }
    void getdetails()
    {
        cin>>rno;
        gets(name);
        cin>>percent;
    }
    void showdetails()
    {
        cout<<rno;
        puts(name);
        cout<<percent;
    }
};
```
### Section - B (Python)

|   |   | Carefully observe the following python code and answer the questions that follow:
|---|---|---|
| 1 | (a) | ```
x=5
def func2():
    x=3
global x
    x=x+1
    print x
    print x
```
On execution the above code produces the following output.
6
3
Explain the output with respect to the scope of the variables.

|   |   | Name the modules to which the following functions belong:
|---|---|---|
| 1 | (b) | a. uniform()  
b. fabs()

|   |   | Rewrite the following code after removing the syntactical errors (if any). Underline each correction.
|---|---|---|
| 2 | (c) | ```
def chksum:
    x= input("Enter a number")
    if (x%2 = 0):
        for i range(2*x):
            print i
            loop else:
        print "#"
``` |

|   |   | Observe the following Python code carefully and obtain the output, which will appear on the screen after execution of it.
|---|---|---|
| 2 | (d) | ```
def Findoutput():
    L = "earn"
    X=""
    L1=[]
    count = 1
    for i in L:
        if i in["a","c","i","o","u"]:  
            X=X+i.swapcase()
        else:
            if (count%2!=0):
                X= X+str(len(L[:count]))
            else:
                X = X+i
        count = count+1
    print X
    Findoutput()
``` |
(e) What output will be generated when the following Python code is executed?
```python
def ChangeList():
    L=[]
    L1=[]
    L2=[]
    for i in range(1,10):
        L.append(i)
    for i in range(10,1,-2):
        L1.append(i)
    for i in range(len(L1)):
        L2.append(L1[i]+L[i])
    print L2
ChangeList()
```

(f) Observe the following program and answer the questions that follow:
```python
import random
X=3
N = random.randint(1,X)
for i in range(N):
    print i,'#',i+1
```

a. What is the minimum and maximum number of times the loop will execute?
b. Find out, which line of output(s) out of (i) to (iv) will not be expected from the program?
   i. 0#1
   ii. 1#2
   iii. 2#3
   iv. 3#4

2 a Explain the two strategies employed by Python for memory allocation.

2 b Observe the following class definition and answer the questions that follow:
class Info:
    ips=0
    def __str__(self): #Function 1
        return "Welcome to the Info Systems"
    def __init__(self):
        self.__Systemdate=""
        self.SystemTime=""
    def getinput(self):
        self.__Systemdate = raw_input("enter data")
        self.SystemTime=raw_input("enter data")
        Info.incrips()
    @staticmethod #Statement 1
    def incrips():
        Info.ips=Info.ips+1
        print "System invoked",Info.ips,"times"

I=Info()
I.getinput()
print I.SystemTime
print I.__Systemdate # Statement 2

i. Write statement to invoke Function 1.
ii. On Executing the above code, Statement 2 is giving an error explain.


c  Define a class PRODUCT in Python with the following specifications
Data members:
Pid – A string to store productid.
Pname - A string to store the name of the product.
Pcostprice – A decimal to store the cost price of the product
Psellingprice – A decimal to store Selling Price
Margin - A decimal to be calculated as Psellingprice - Pcostprice
Remarks - To store"Profit" if Margin is positive else "Loss" if Margin is negative

Member Functions:

• A constructor function to initialize All the data members with valid default values.
• A method SetRemarks() that assigns Margin as Psellingprice - Pcostprice and sets Remarks as mentioned below:

<table>
<thead>
<tr>
<th>Margin</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0 (negative)</td>
<td>Loss</td>
</tr>
</tbody>
</table>
- A method `Getdetails()` to accept values for `Pid`, `Pname`, `Pcostprice`, `Psellingprice` and invokes `SetRemarks()` method.
- A method `Setdetails()` that displays all the data members.

```python
class Shop(object):
    def __init__(self):
        self.no_of_employees = 0
        self.no_of_brands = 0
    def getdata(self):
        self.no_of_employees = input("Number of employees")
        self.no_of_brands = input("Number of brands")
    def showdata(self):
        print(self.no_of_employees)
        print(self.no_of_brands)

class Brand(object):
    def __init__(self):
        self.name = ""
        self.category = ["Mens", "Womens", "Kids"]
        self.avgprice = 0.0
    def getdata(self):
        self.name = raw_input("Enter Brand Name")
        self.avgprice = input("Enter Average Price")
    def showdata(self):
        print(self.name)
        print(self.category)
        print(self.avgprice)

class Mall(Brand, Shop):
    def __init__(self):
        self.no_of_shops = 0
    def getdata(self):
        super(Mall, self).getdata()  # Statement 1
        super(Mall, self).getdata()  # Statement 2
        self.no_of_shops = input("Enter number of shops")
    def showdata(self):
        print(self.no_of_shops)
        print(self.no_of_brands)
```

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

- Question (i): What is the purpose of the `__init__` method in the `Shop` class?
- Question (ii): What does the `getdata` method in the `Brand` class do?
- Question (iii): How is the `avgprice` attribute of the `Brand` class initialized?
- Question (iv): What is the role of the `Statement 1` and `Statement 2` in the `getdata` method of the `Mall` class?
<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>i.</td>
<td>Which type of Inheritance is demonstrated in the above code?</td>
<td></td>
</tr>
<tr>
<td>ii.</td>
<td>Explain Statement 1 and 2.</td>
<td></td>
</tr>
<tr>
<td>iii.</td>
<td>Name the methods that are overridden along with their class name.</td>
<td></td>
</tr>
<tr>
<td>iv.</td>
<td>Fill Blank1 with a statement to display variable category of class Brand.</td>
<td></td>
</tr>
</tbody>
</table>
| 3a | Consider the following unsorted list  
95 79 19 43 52 3  
Write the passes of bubble sort for sorting the list in ascending order till the 3rd iteration. | 3 |
| 3b | Kritika was asked to accept a list of even numbers but she did not put the relevant condition while accepting the list of numbers. You are required to write a code to convert all the odd numbers into even by multiplying them by 2. | 3 |
| 3c | Aastha wants to create a program that accepts a string and display the characters in the reverse order in the same line using a Stack. She has created the following code, help her by completing the definitions on the basis of requirements given below:  
```
class mystack:
    def __init__(self):
        self.mystr= _______  # Accept a string
        self.mylist = _______  # Convert mystr to a list
    def disp(self):
        
        
```
 | 4 |
| 3d | Write a generator function generatesq() that displays the square roots of numbers from 100 to n where n is passed as an argument. | 2 |
| 3e | Evaluate the following Postfix expression:  
20,10,-,15,3,/,+,5,* | 2 |
| 4a | Observe the following code and answer the questions that follow:  
```
File = open("Mydata","a")
_________  #Blank1
File.close()
```
i. What type (Text/Binary) of file is Mydata? | 1 |
ii. Fill the Blank 1 with statement to write “ABC” in the file “Mydata”

b. A text file “Quotes.Txt” has the following data written in it:

- Living a life you can be proud of
- Doing your best
- Spending your time with people and activities that are important to you
- Standing up for things that are right even when it’s hard
- Becoming the best version of you

Write a user defined function to display the total number of words present in the file.

c. Consider the following class declaration and answer the question that follows:

```python
import pickle
class Student:
    def __init__(self):
        self.name=""
        self.percent=0.0
    def inputdata(self):
        self.name=input("Enter Name")
        self.percent=input("Enter Percentage scored")
    def returnpercent(self):
        return (self.percent)
    def displaydata(self):
        print "Name:",self.name
        print "Percent:",self.percent
```

A nuj has been asked to display all the students who have scored less than 40 for Remedial Classes.

Write a user defined function to display all those students who have scored less than 40 from the binary file “Student.dat” assuming it stores all the object of the class Student mentioned above.

Section – C

5. (a) Observe the table ‘Club’ given below:

<table>
<thead>
<tr>
<th>Member_id</th>
<th>Member_Name</th>
<th>Address</th>
<th>Age</th>
<th>Fee</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Club</th>
</tr>
</thead>
</table>
i. What is the cardinality and degree of the above given table?
ii. If a new column contact_no has been added and three more members have joined the club then how these changes will affect the degree and cardinality of the above given table.

(b) Write SQL commands for the queries (i) to (iv) and output for (v) to (viii) based on the tables ‘Watches’ and ‘Sale’ given below.

| Watches | | | | | |
|---------|---------|-------|-------|-------|
| Watchid | Watch_Name | Price | Type | Qty_Store |
| W001    | HighTime   | 10000 | Unisex | 100   |
| W002    | LifeTime   | 15000 | Ladies | 150   |
| W003    | Wave       | 20000 | Gents | 200   |
| W004    | HighFashion| 7000  | Unisex | 250   |
| W005    | GoldenTime | 25000 | Gents | 100   |

<table>
<thead>
<tr>
<th>Sale</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Watchid</td>
<td>Qty_Sold</td>
<td>Quarter</td>
</tr>
<tr>
<td>W001</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>W003</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>W002</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>W003</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>W001</td>
<td>15</td>
<td>3</td>
</tr>
<tr>
<td>W002</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>W005</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>W003</td>
<td>15</td>
<td>4</td>
</tr>
</tbody>
</table>

i. To display all the details of those watches whose name ends with ‘Time’

ii. To display watch’s name and price of those watches which have price range in between 5000-15000.

iii. To display total quantity in store of Unisex type watches.

iv. To display watch name and their quantity sold in first quarter.

v. select max(price), min(qty_store) from watches;
vi. select quarter, sum(qty_sold) from sale group by quarter;

vii. select watch_name, price, type from watches w, sale s where w.watchid!=s.watchid;

viii. select watch_name, qty_store, sum(qty_sold), qty_store-sum(qty_sold) "Stock" from watches w, sale s where w.watchid=s.watchid group by s.watchid;

### 6 (a) Correct the following boolean statements:

1. X+1 = X  
2. (A')'=A'  
3. A+A'=0  
4. (A+B)' = A.B

### 6 (b) Draw the equivalent logic circuit for the following Boolean expression:

\((A.B)+C\)

### 6 (c) Write the POS form of a Boolean Function F, which is represented in a truth tale as follows:

<table>
<thead>
<tr>
<th>P</th>
<th>Q</th>
<th>R</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>1</td>
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</tbody>
</table>

### 6 (d) Reduce the following Boolean Expression using K Map:

\[ F(A,B,C,D)= \Sigma(0,1,3,5,6,7,9,11,13,14,15) \]

### 7 (a) Identify the type of topology on the basis of the following:

1. Since every node is directly connected to the server, a large
amount of cable is needed which increases the installation cost of the network.

2. It has a single common data path connecting all the nodes.

(b) Expand the following:
   a. VOIP
   b. SMTP

(c) Who is a hacker?

(d) The following is a 32 bit binary number usually represented as 4 decimal values, each representing 8 bits, in the range 0 to 255 (known as octets) separated by decimal points.
   140.179.220.200
   What is it? What is its importance?

(e) Daniel has to share the data among various computers of his two offices branches situated in the same city. Name the network (out of LAN, WAN, PAN and MAN) which is being formed in this process.

(f) Rehaana Medicos Center has set up its new center in Dubai. It has four buildings as shown in the diagram given below:

Distances between various buildings are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts to Research Lab</td>
<td>55 m</td>
</tr>
<tr>
<td>Accounts to Store</td>
<td>150 m</td>
</tr>
<tr>
<td>Store to Packaging Unit</td>
<td>160 m</td>
</tr>
<tr>
<td>Packaging Unit to Research Lab</td>
<td>60 m</td>
</tr>
<tr>
<td>Accounts to Packaging Unit</td>
<td>125 m</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Store to Research Lab</td>
<td>180 m</td>
</tr>
</tbody>
</table>

Number of Computers

<table>
<thead>
<tr>
<th>Accounts</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research Lab</td>
<td>100</td>
</tr>
<tr>
<td>Store</td>
<td>15</td>
</tr>
<tr>
<td>Packaging Unit</td>
<td>60</td>
</tr>
</tbody>
</table>

As a network expert, provide the best possible answer for the following queries:

i) Suggest a cable layout of connections between the buildings.

ii) Suggest the most suitable place (i.e. buildings) to house the server of this organization.

iii) Suggest the placement of the following device with justification:
    a) Repeater
    b) Hub/Switch

iv) Suggest a system (hardware/software) to prevent unauthorized access to or from the network.