1. (a) Name the header file required for successful compilation of the given snippet:
   ```
   void main()
   {
   ifstream fin("story.txt");
   char ch;
   int alpha=0;
   if(isalpha(fin.get(ch))
   ++alpha;
   fin.close();
   getch();
   }
   ```
   (1)

   (b) What is the difference between entry controlled loop and exit controlled loop? Illustrate your answer with a C++ valid code.
   (2)

   (c) Rewrite the following code after removing syntactical error(s), if any. Underline each correction:
   ```
   #include<iostream.h>
   class Exams
   {
   char E_name[30], S_name[30];
   int SNos = 100;
   float marks[3];
   public:
   Exams ( ) { };
   void input( )
   {strcpy(E_name, "Computer Science ");
   strcpy(S_name, "Amen Singhania ");
   cin>>marks;
   }.
   void output( )
   {
   cout<<"Name "<S_name<<endl;
   cout<<"S_Name"<<E_name<<endl;
   cout<<"Number "<<SNos<<endl;
   }
   ```
   (2)

};

void main()
{
    Exams E;
    E.input;
    E.display;
}

(d) Write the output of the following code:

```c
#include <iostream.h>
#include <ctype.h>
#include <string.h>

void change(char *state, int &s)
{
    int b = s;
    for (int x = 0; s >= 0; x++, s--) if ((x + s) % 2)
        *(state + x) = toupper(*(state + b - x));
}

don
{
    char s[] = "Punjab";

    int b = strlen(s) - 1;
    change(s, b);
    cout << s << '#' << b;
}
```

(e) Find the output of the following code:

```c
#include <iostream.h>

void split(int array[], int breaks[])
{
    for (int i = 0; i < 6; i++)
    {
        if (array[i] > breaks[i]) array[i] += 10;
        else breaks[i] += 5;
    }
}

don
{
    int arr[] = {14, 23, 45, 21, 76, 18};
    int change[10];

    for (int i = 0; i < 6; i++)
    {
        if (arr[i] > arr[i + 1]) change[i] = arr[i];
        else change[i] = arr[i + 1];
    }

    split(arr, change);

    for (i = 0; i < 6; i++)
    {
        if (i % 2 == 0) cout << arr[i] + change[i] << '#';
    }
```
else            cout<"change[\text{-}arr[i]]<"***;    

}
}

(f) Choose the correct alternative from the options (i)-(iv). Justify your answer. (2)
#include<iostream.h>
#include<stdlib.h>
#define Getval (N) ((N%2==0)? N+1:N+2)    
void main( )
{
    randomize( );
    int num=random(3)+3;
    for( int i=num; i<num+2 ;i++)
        cout<<Getval(i)<<"@" ;
}

Options:
(a) 3@5@7@
(b) 7@5@9@
(c) 7@9@9@
(d) 7@9@11@

2. (a) What is the importance of constructor in OOP? Explain with the help of an example. (2)
(b) Given the following C++ code, answer the questions i to x : (10)
class readbook
{
    char *title;
    int no_of_pages;
    char * author;
    public:
    void readchapter()    //Function 1
    {
        cout<<"Reading chapter one<<endl;  
    }
    readbook()            //Function2
    {
        cout<<"Open the Book"<<endl;
    }
    readbook(char *t,int n,char *a);    //Function 3
    readbook( readbook &x);            //Function 4
readbook( ) //Function 5
{
    cout<<"Close the book"<<endl;
}

(i) In OOP, what is Function 2 referred to?
(ii) Write a statement to invoke Function 2.
(iii) Complete the definition of Function 3.
(iv) In OOP, what does Function 3 represent?
(v) Write a statement to invoke Function 3.
(vi) Complete the definition of Function 4.
(vii) Write a statement (s) to invoke Function 4.
(viii) When is function 5 invoked?
(ix) Which feature of OOP is displayed by Function 2 to Function 4?
(x) Will readbook() be inherited by any of the derived classes of the class Readbook?
(c) Design a class Composite to fill an array of order \([m \times n]\) with the first \([m \times n]\)
    composite numbers column wise. The details of the members of the class are
    given below:
    
    **Class name** : Composite
    
    **Data members/instance variables**:
    
    arr[ ] [ ] : Two dimensional array.
    m : integer to store the number of rows.
    n : integer to store the number of columns.
    
    **Member functions**:
    
    Composite( ) : to accept the size of the array.
    int isComposite (int p) : return 1, if number is composite and 0, if not composite.
    void fill( ) : to fill the elements of the array with the first \((m \times n)\) composite
    numbers.
    void display( ) : displays the array in a matrix form.
    
    Specify the class Composite giving details of the constructor and member
    functions int isComposite(int), void fill( ) and void display( ) with main( ) function
    to create an object and call the function accordingly.

(d) Define a class TEST in C++ with following description:

**Private Members**

    TestCode of type integer
    Description of type string
    NoCandidate of type integer
CenterReqd (number of centres required) of type integer

A member function CALCNTR() to calculate and return the number of centres as (NoCandidates/100+1)

Public Members

- A function SCHEDULE() to allow user to enter values for TestCode, Description, NoCandidate & call function CALCNTR() to calculate the number of Centres
- A function DISPTEST() to allow user to view the content of all the data members

(e) Answer Questions i to x after going through the following code:

```cpp
class drama {
    char dname[20];
    int Dduration;
    protected:
        drama();
    char doctors[10] [20];
    public:
        void enteredrama();
        void displaydrama();
};

class realityshow {
    char name[15];
    int Rduration;
    protected:
        realityshow();
    char Rparticipants[15][20];
    public:
        void enteredreality();
        void dispreality();
};

class news{
    int Nduration;
    char nreader[10][15];
    public:
        news();
        void enternews();
        void dispnews();
};

class tvprog : public drama, private realityshow, public news {
    char chnlgrp[20];
    float pkgcost;
```
public:
  tvprog();
  void enterprog();
  void dispprog();
  void enterreality();
};
void main()
{tvprog obj;
}

(i) Which type of inheritance is exhibited in the above example?
(ii) Write the names of all members accessible from dispprog() of class tvprog.
(iii) Write name of all data members accessible from object of class tvprog.
(iv) Calculate size of an object of class tvprog.
(v) Write the order for the call of the constructors when object of class tvprog is declared.
(vi) Which function enterreality() will be executed on issuing the command obj.enterreality?
(vii) Calculate the size of an object of class tvprog, if reality show is inherited protected instead of privately.
(viii) What will be the sequence of execution of constructors in the above program?
(ix) What will be the sequence of execution of destructors in the above program?
(x) Name the base and derived classes of tvprog class.

3. (a) Write a user defined function in C++ to search a students record from the given array of structure using binary search technique. Assume the array is sorted in descending order of the roll number. Assume the following definition:
struct Student {
  char name[20];
  long rollno;
};

(b) An array X[5][20] is stored in the memory along the column with each element occupying 4 bytes of memory. Calculate the address of an element X[2][15], if the element X[3][10] is stored at the address 2200.

(c) Write a function in C++ to insert an element in a dynamically allocated Queue containing the names of the countries. Give necessary declarations.

(d) Write a user defined function in C++ which accepts a squared integer matrix with odd dimensions (3*3, 5*5 ...) & display the square of the elements which lie on both diagonals. For ex.:
2 5 7
3 7 2
5 6 9

The output should be:
Diagonal one: 4, 49, 81
Diagonal two: 49, 49, 25

(e) Write a function in C++ to replace the repeating elements in an array by 0. The zeros should be shifted to the end. The order of the array should not change.

Eg: Array: 10, 20, 30, 10, 40, 20, 30
Result: 10, 20, 30, 40, 0, 0, 0

(f) Evaluate the following postfix expression showing the stack content:
False, True, NOT, OR, True, False, AND, OR.

4. (a) Differentiate between ios::app and ios::ate file opening modes.
(b) Assume that a text file named "FILE.TXT" already contains some text written into it. But while writing into the file, the word "when" has been misspelled "whn" everywhere in the file. Write a function named Corrections() in C++ that reads the file "FILE.TXT" and corrects the word "whn".
(c) Given a binary file BOOK.DAT containing records of the following type:

class user
{
    char uname[20], status; // A active I inactive.
    int uid;
    public:
    void readdetails();
    void showdetails();
    char getstatus() {
        return status;
    }
    void setstatus(char s) {
        status = s;
    }
    int getid() {
        return id;
    }
};

Write a function which changes the status of all users with previous status as 'I' to 'A'.
(d) Considering the text file already contains the following word "September" (Double Quotes are not the part of the text.) What will be the output of the following:
void main()
{
    ofstream fout("NOTES.TXT", ios::app);
    fout<<"Exams ";
    cout<<fout.tellp();
    fout.close();
}

(d) Write a function in C++ which will print the size of a text file "story.txt" in the form of bytes.

(e) Observe the program segment given below carefully and fill in the blanks marked as Statement 1 and Statement 2 for performing the required task.
#include<iostream.h>
#include<fstream.h>
void main(void)
{
    char filename[ ] = "C:\testfileio3.txt";
    ofstream inputfile, outputfile;
    int length;
    char * buffer;
    // .................. create, open and write data to file ..................
    outputfile.open(filename, ios::out);
    // .................. write some text  ..................
    outputfile<<"This is just line of text."<<endl;
    // .................. close the output file  ..................
    outputfile.close();
    // .................. opening and reading data from file ..................
    inputfile.open(filename, ios::in);
    cout<<"The "<<filename<<" file was opened successfully!\n";
    cout<<"nMove the pointer to the end\n"
<<"Then back to the beginning with\n"
<<"10 offset. The pointer now at...\n"<<endl;
    // flush the stream buffer explicitly...
    cout<<flush;
    // get length of file move the get pointer to the end of the stream
    inputfile.seekg(0, ios::end);
    // This statement returns the current stream position.
    length = ...................................................... //Statement
    cout<<"length variable = "<<length<<"\n";
}
// dynamically allocate some memory storage for type char...
buffer = new char [length];
// move back the pointer to the beginning with offset of 10
// read data as block from input file...
inputfile.read(buffer, length);
cout<<buffer;
// free up the allocated memory storage...
delete buffer;
inputfile.close();