Chapter 10

Data Files

Er. Shiva K. Shrestha (HoD)

Department of Computer Engineering,

Khwopa College of Engineering

Introduction

	Record I/O	Formatted I/O	String I/O	Character I/O
Standard I/O	fread()	fscanf()	fgets()	fgetc()
	fwrite()	fprintf()	fputs()	fputc()
System I/O	fread()	-	-	-
	fwrite()	-	-	-

File Operations

Er. Shiva K. Shrestha (HoD, Computer Department)

Library Functions for Reading/Writing from/to a File

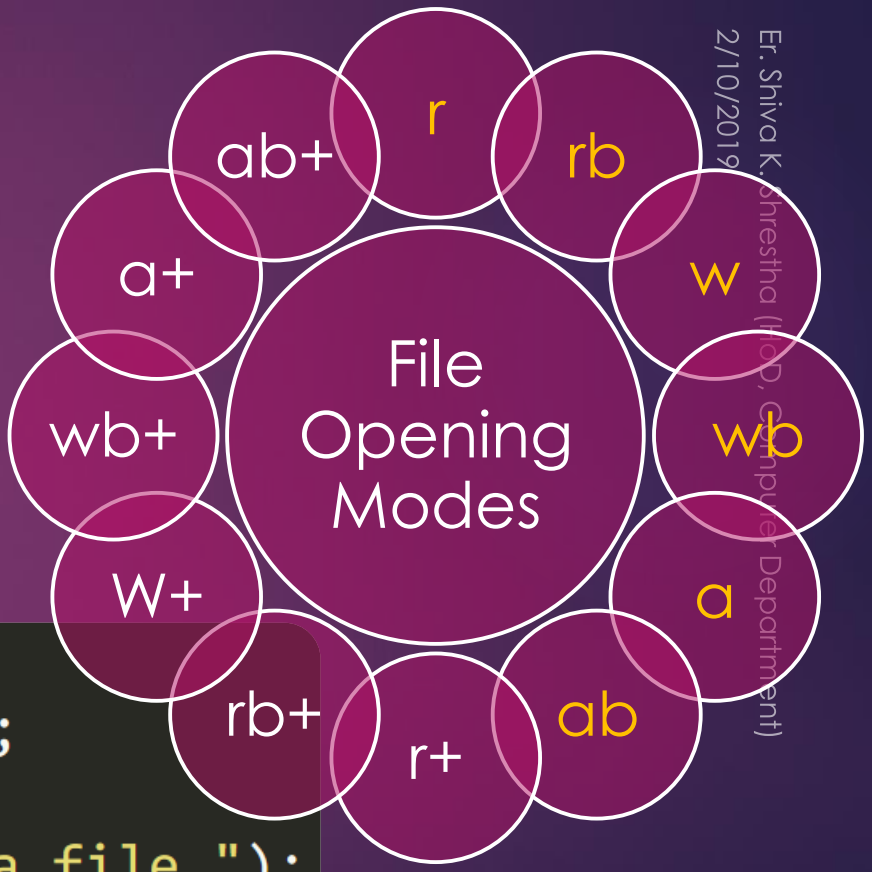
fopen()	•Opens a file
fclose()	•Closes a file
putc()	•Writes a character to a file
fputc()	•Same as putc()
getc()	•Reads a character from a file
fgetc()	•Same as getc()
fgets()	•Seads a string from a file
fputs()	•Writes a string from a file
fseek()	•Seeks to a specified byte in a file
ftell()	•Returns the current file position
fprintf()	•Is to a file what printf() is to the console
fscanf()	•Is to a file what scanf() is to the console
feof()	•Return true if end-of-file is reached
ferror()	•Return true if an error has occurred
rewind()	•Resets the file position indicator to the beginning
remove()	•Erases a file
fflush()	•Flushes a file

File Opening Modes

File Mode	Meaning of Mode	During Inexistence of file
r	Open for reading.	If the file does not exist, fopen() returns NULL.
rb	Open for reading in binary mode.	If the file does not exist, fopen() returns NULL.
w	Open for writing.	If the file exists, its contents are overwritten. If the file does not exist, it will be created.
wb	Open for writing in binary mode.	If the file exists, its contents are overwritten. If the file does not exist, it will be created.
a	Open for append. i.e, Data is added to end of file.	If the file does not exists, it will be created.
ab	Open for append in binary mode. i.e, Data is added to end of file.	If the file does not exists, it will be created.
r+	Open for both reading and writing.	If the file does not exist, fopen() returns NULL.
rb+	Open for both reading and writing in binary mode.	If the file does not exist, fopen() returns NULL.
w+	Open for both reading and writing.	If the file exists, its contents are overwritten. If the file does not exist, it will be created.
wb+	Open for both reading and writing in binary mode.	If the file exists, its contents are overwritten. If the file does not exist, it will be created.
a+	Open for both reading and appending.	If the file does not exists, it will be created.
ab+	Open for both reading and appending in binary mode.	If the file does not exists, it will be created.

Error Handling


```
FILE *fp; // fp is file_pointer
fp=fopen(file_name, mode);
if(fp == NULL){
     printf("Cannot open a file.");
     fclose(fp);
}
```



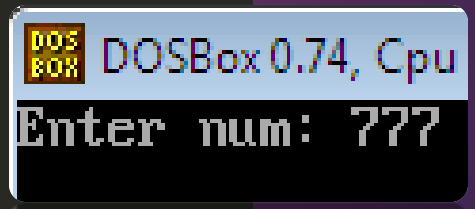

```
FILE *fp;
fp=fopen("kce.txt","a+");
if(fp == NULL){
    printf("Cannot open a file.");
    fclose(fp);
}
```

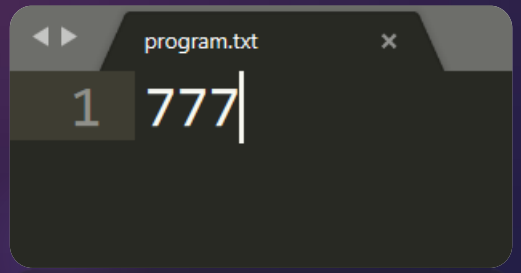
Writing to a Text File

Er. Shiva K. Shrestha (HoD, Computer Department)
2/10/2019

FILE_1.C

```c
#include <stdio.h>
#include <conio.h>
int main(){
    int num;
    FILE *fptr;
    fptr = fopen("program.txt","w");

    if(fptr == NULL){
      printf("Error!");
    }
    printf("Enter num: ");
    scanf("%d",&num);

    fprintf(fptr,"%d",num);
    fclose(fptr);
    getch();
    return 0;
}
```

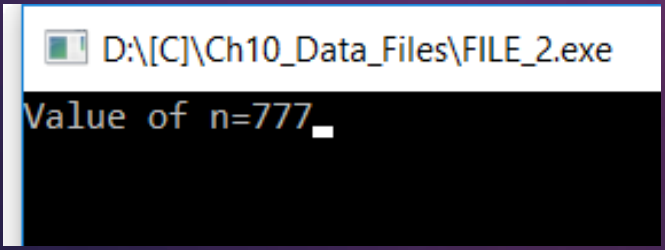


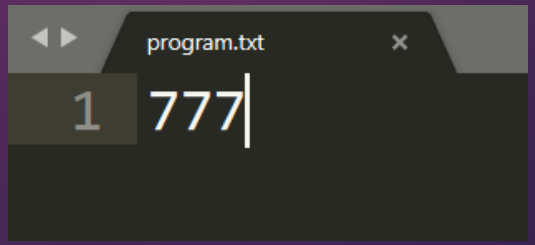


Reading from a Text File

FILE_2.C

```c
#include <stdio.h>
#include <conio.h>
int main(){
    int num;
    FILE *fptr;
    if ((fptr = fopen("program.txt","r")) == NULL){
        printf("Error! opening file");
    }
    fscanf(fptr,"%d", &num);

    printf("Value of n=%d", num);
    getch();
    return 0;
}
```





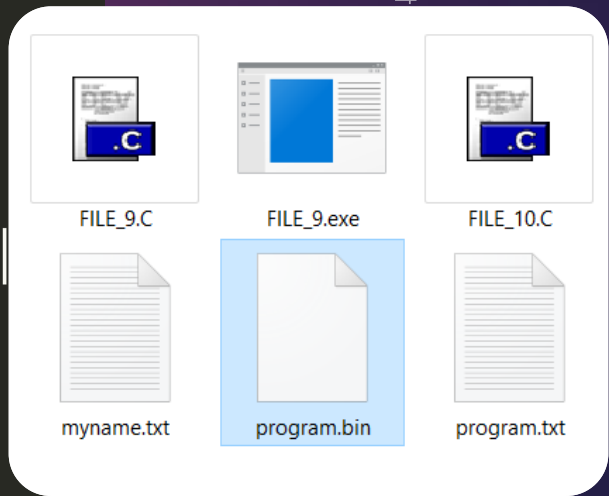
Er. Shiva K. Shrestha (HoD, Computer Department)

Writing to a Binary File

fwrite(address_data, size_data, numbers_data, pointer_to_file);

FILE_3.C

```c
#include <stdio.h>
#include <conio.h>
struct Num{
   int n1, n2, n3;
};
int main(){
    int i;
    struct Num n;
    FILE *fptr;
    if ((fptr=fopen("program.bin","wb")) == NULL){
       printf("Error! opening file");
    }
    for(i=1; i<5; i++){
      n.n1 = i;
      n.n2 = i*i;
      n.n3 = i*i*i;
      fwrite(&n, sizeof(struct Num), 1, fptr);
    }
    fclose(fptr);
    getch(); return 0;
}
```



Er. Shiva K. Shrestha (HoD, Computer Depart

Reading from a Binary File

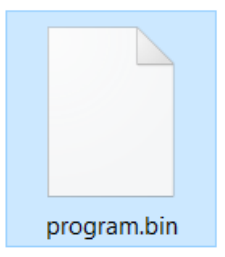
fread(address_data, size_data, numbers_data, pointer_to_file);

FILE_4.C

```c
#include <stdio.h>
#include <conio.h>
struct Num{
   int n1, n2, n3;
};
int main(){
    int i;
    struct Num n;
    FILE *fptr;
    if ((fptr=fopen("program.bin","rb")) == NULL){
       printf("Error! opening file");
    }
    for(i=1; i<5; ++i){
      fread(&n, sizeof(struct Num), 1, fptr);
      printf("n1: %d\tn2: %d\tn3: %d\n", n.n1, n.n2, n.n3);
    }
    fclose(fptr);
    getch();
    return 0;
}
```

D:\[C]\Ch10_Data_Files\FILE_4.exe

```
n1: 1   n2: 1   n3: 1
n1: 2   n2: 4   n3: 8
n1: 3   n2: 9   n3: 27
n1: 4   n2: 16  n3: 64
```



End of File (EOF)

EOF

```
char ch;
FILE *fp;
fp=fopen("kce.txt","r");

if(fp == NULL){
    printf("Cannot open a file.");
    fclose(fp);
}

while((ch=getc(fp)) != EOF){
    printf("%c",ch);
}
```

feof()

- The function feof() determines when the end of the file has been encountered. The feof() function has this prototype:
  - int feof(FILE *fp);
- feof() returns true(1) if the end of the file has been reached; otherwise, it returns 0
- e.g. while(!feof(fp))

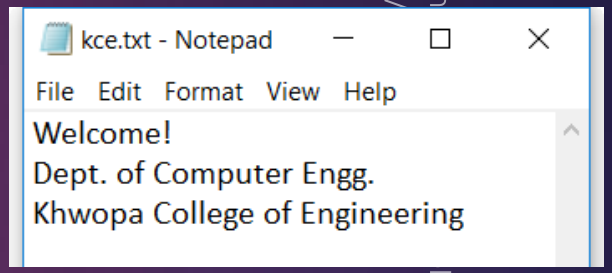
Using rewind() Function

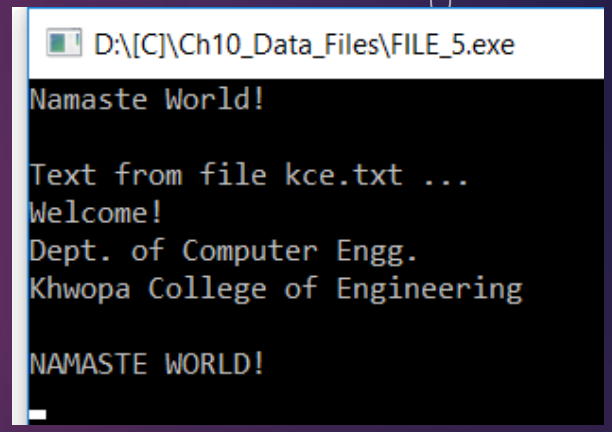
- The rewind() function resets the file position indicator to the beginning of the file specified as its arguments. That is, it "rewinds" the file. Its prototype is
  - void rewind(FILE *fp);
- where, fp is a valid file pointer.

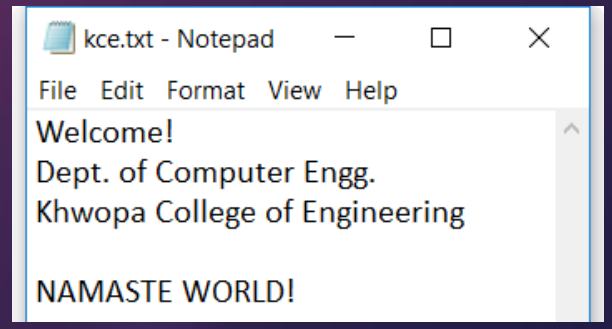
Character I/O Functions in File getc(), putc(), fgetc(), & fputc()

FILE_5.C

```c
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<ctype.h>
int main(){
    char ch; FILE *fp;
    fp=fopen("kce.txt","a+");
    if(fp==NULL){
        printf("cannot open file"); fclose(fp);
    }
    do{
        ch=toupper(getchar());
        putc(ch,fp);
    }while(ch!='\n');
    printf("\nText from file kce.txt ...\n");
    rewind(fp);
    while((ch=getc(fp)) != EOF){
        printf("%c",ch);
    }
    fclose(fp); getch(); return 0;
}
```



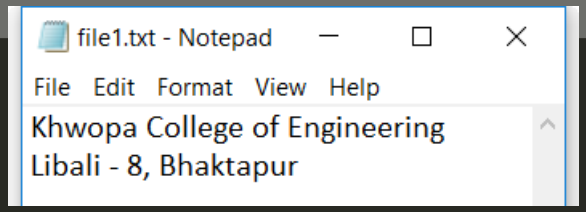


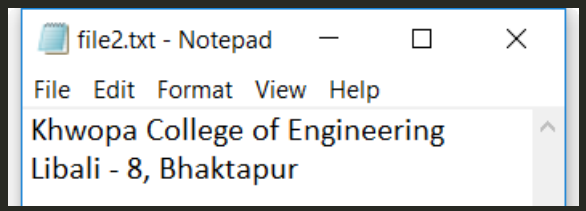


File Copy Program

FILE_6.C

```c
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<ctype.h>
int main(){
    char ch;
    FILE *fs,*ft;
    fs=fopen("file1.txt","r");
    if(fs==NULL){
        printf("Cannot open source file."); fclose(fs);
    }
    ft=fopen("file2.txt","w");
    if(ft==NULL){
        printf("Cannot open target file."); fclose(ft);
    }
    while((ch=fgetc(fs))!=EOF){
        fputc(ch,ft);
    }
    fclose(fs); fclose(ft);
    getch(); return 0;
}
```





String I/O Function in File
fputs() & fgets()

FILE_7.C

```c
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
#include<string.h>
int main(){
    char s[25]; FILE *fp;
    fp=fopen("console2file.txt","a+");
    if(fp==NULL){
        puts("Cannot open file"); fclose(fp);
    }
    do{
        printf("Enter a string to store in data file:");
        gets(s); strcat(s,"\n"); fputs(s,fp);
    }while(*s!='\n');
    rewind(fp);
    while(!feof(fp)){
        fgets(s,2,fp); puts(s);
    }
    fclose(fp);
    getch(); return 0;
}
```

D:\[C]\Ch10_Data_Files\FILE_7.exe

```
Enter a string to store in data file:Nepal
Enter a string to store in data file:State 3
Enter a string to store in data file:Bhaktapur District
Enter a string to store in data file:Bhaktapur Municipality
Enter a string to store in data file:KCE
Enter a string to store in data file:
N
e
p
a
l
```


console2file.txt - Notepad

File Edit Format View Help

```
Nepal
State 3
Bhaktapur District
Bhaktapur Municipality
KCE
```

Formatted Disk I/O Functions in File fscanf() & fprintf()

FILE_8.C

```c
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
int main(){
    char choice; char name[40]; int age; float height; FILE *fp;
    fp=fopen("student.txt","w+");
    do{
        printf("Enter Name: "); scanf("%s",name); fflush(stdin);
        printf("Enter Age: "); scanf("%d",&age); fflush(stdin);
        printf("Enter Height: "); scanf("%f",&height); fflush(stdin);
        printf("\nDo you wish to continue ('y/n')? ");
        scanf("%c",&choice);
        fprintf(fp,"%s\t%d\t%f",name,age,height);
    }while(choice=='Y'||choice=='y');
    rewind(fp);
    while(!feof(fp)){
        fscanf(fp,"%s%d%f",name,&age,&height);
        printf("\n%s\t%d\t%0.2f",name,age,height);
    }
    fclose(fp); getch(); return 0;
}
```

student.txt - Notepad

File Edit Format View Help

Kareena 18 5.700000Sushant 17 5.800000

D:\[C]\Ch10_Data_Files\FILE_8.exe

```
Enter Name: Kareena
Enter Age: 18
Enter Height: 5.7

Do you wish to continue ('y/n')? y
Enter Name: Sushant
Enter Age: 17
Enter Height: 5.8

Do you wish to continue ('y/n')? n

Kareena 18      5.70
Sushant 17      5.80
```

Record I/O Functions in File fread() & fwrite()

FILE_9.C

```c
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
struct Employee{
    char name[40]; int age; float sal;
};
int main(){
    struct Employee e;
    FILE *fp; char choice;
    fp=fopen("employee.txt","a+b");
    if(fp==NULL){ printf("Cannot open the file!"); }
    do{
        printf("Enter Name, Age, & Basic Salary:\n");
        scanf("%s%d%f", e.name, &e.age, &e.sal);
        fwrite(&e,sizeof(e),1,fp);
        fflush(stdin); printf("Add another record(y/n)? ");
        scanf("%c",&choice);
    }while(choice=='Y'||choice=='y');
    rewind(fp); //Moves file pointer to starting
    while(!feof(fp)){
        fread(&e,sizeof(e),1,fp);
        printf("\n%s\t%d\t%f",e.name,e.age,e.sal);
    }
    fclose(fp); getch(); return 0;
}
```

D:\[C]\Ch10_Data_Files\FILE_9.exe

```
Enter Name, Age, & Basic Salary:
Ramesh 27 40000
Add another record(y/n)? y
Enter Name, Age, & Basic Salary:
Udaya 34 80000
Add another record(y/n)? n

Ramesh   27      40000.000000
Udaya    34      80000.000000
```


Why?

employee.txt - Notepad

File Edit Format View Help

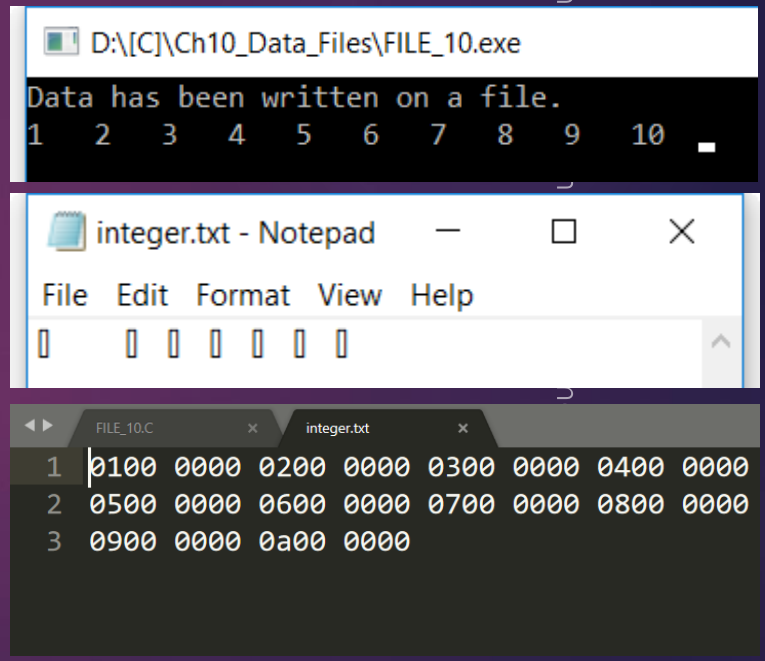
```
Ramesh ÿ"    ▯    ‰%@    "    ▯
@GUdaya ÿ"    ▯    ‰%@    "    "
@œG
```

Reading & writing arrays with record I/O functions

Er. Shiva K. Shresth
2/10/2019

FILE_10.C

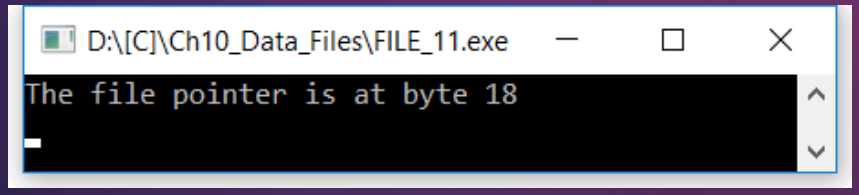
```c
#include<stdio.h>
#include<conio.h>
#include<stdlib.h>
int a[10]={1,2,3,4,5,6,7,8,9,10}, b[10];
int main(){
    FILE *ftp;
    int i;
    ftp=fopen("integer.txt","wb+");
    if(ftp==NULL){
        printf("Cannot open a file.");
    }else{
        fwrite(a,sizeof(a),1,ftp);
    }
    printf("Data has been written on a file.\n");
    rewind(ftp);
    while(!feof(ftp))
        fread(b,sizeof(b),1,ftp);

    for(i=0;i<10;i++){
        printf("%-4d",b[i]);
    }
    fclose(ftp);
    getch(); return 0;
}
```

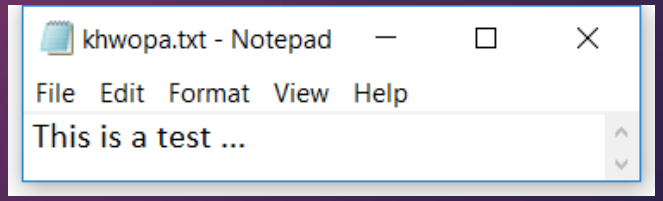


Using ftell() Function

FILE_11.C

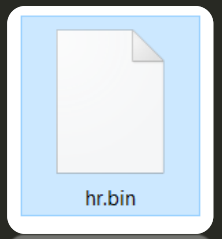
```c
#include<stdio.h>
#include<conio.h>
int main(){
    FILE *stream;
    stream = fopen("khwopa.txt", "w+");
    fprintf(stream, "This is a test ...");
    printf("The file pointer is at byte %ld\n", ftell(stream));
    fclose(stream);
    getch();
    return 0;
}
```





FILE_12.C

```c
#include<stdio.h>
#include<conio.h>
struct HR{
    char name[10];  char address[15];
    long int phone; char qualification[10];
}e,h[5]={
    {"Ramesh","Samjur",9849761940,"SLC"},
    {"Dinesh","Majhgaun",9801061940,"SEE"},
    {"Harish","Pokhara",9811111111,"ME"},
    {"Pawan","Bandipur",9822222222,"MSc"},
    {"Sushmita","Dumre",9833333333,"PhD"},
};
int main(){
    int end_pos, current_pos, total, n, i;
    char choice;
    FILE *f;
    f = fopen("hr.bin","ab+");
    for(i=0;i<5;i++){
        fwrite(&h[i],sizeof(struct HR),1,f);
    }
    rewind(f);
    fseek(f,0,SEEK_END);
    end_pos=ftell(f);
    total=end_pos/sizeof(struct HR);
    do{
        printf("There are %d structures, which you want to view? ",total);
        scanf("%d",&n);
        current_pos=(n-1)*sizeof(struct HR);
        fseek(f,current_pos,SEEK_SET);
        fread(&e,sizeof(struct HR),1,f);
        printf("\nThe name is %s.\n",e.name);
        printf("The address is %s.\n",e.address);
        printf("The phone no is %ld.\n",e.phone);
        printf("The qualification is %s.\n",e.qualification);
        fflush(stdin);
        printf("Do you want to see some other records(y/n)? ");
        scanf("%c",&choice);
    }while(choice=='Y'||choice=='y');
    fclose(f); getch(); return 0;
}
```



D:\[C]\Ch10_Data_Files\FILE_12.exe

```
There are 5 structures, which you want to view? 1

The name is Ramesh.
The address is Samjur.
The phone no is 1259827348.
The qualification is SLC.
Do you want to see some other records(y/n)? y
There are 5 structures, which you want to view? 3

The name is Harish.
The address is Pokhara.
The phone no is 1221176519.
The qualification is ME.
Do you want to see some other records(y/n)? y
There are 5 structures, which you want to view? 5

The name is Sushmita.
The address is Dumre.
The phone no is 1243398741.
The qualification is PhD.
Do you want to see some other records(y/n)? n
```

FILE_12.C | hr.bin

```
5261 6d65 7368 0000 0000 5361 6d6a 7572
0000 0000 0000 0000 0000 0000 9470 174b
534c 4300 0000 0000 0000 0000 4469 6e65
7368 0000 0000 4d61 6a68 6761 756e 0000
0000 0000 0000 0000 3456 3048 5345 4500
0000 0000 0000 0000 4861 7269 7368 0000
0000 506f 6b68 6172 6100 0000 0000 0000
```

hr.bin - Notepad

File Edit Format View Help

```
Ramesh  Samjur      ”p□KSLC
Dinesh  Majhgaun     4V0HSEE
Harish  Pokhara     Ç¬ÉHME
Pawan   Bandipur     Ž7sIMSc
Sushmita Dumre       UÂJPhD
```

Task

- Modify Program#12 to take input from user using structure to store information of HR. User should view any information of saved HRs.

```
15      for(i=0;i<5;i++){
16          printf("Enter Name: ");
17          scanf("%s",h[i].name);
18          printf("Enter Address: ");
19          scanf("%s",h[i].address);
20          printf("Enter Phone No.: ");
21          scanf("%ld",&h[i].phone);
22          printf("Enter Qualification: ");
23          scanf("%s",h[i].qualification);
24          fwrite(&h[i],sizeof(struct HR),1,fptr);
25          //clrscr();
26      }
```

```
D:\[C]\Ch10_Data_Files\FILE_12_2.exe
Enter Name: Sundar
Enter Address: Bandipur
Enter Phone No.: 9849761940
Enter Qualification: ISc
Enter Name: Laxmi
Enter Address: Chitwan
Enter Phone No.: 9801061940
Enter Qualification: SLC
Enter Name: Shiva
Enter Address: Samjur
Enter Phone No.: 9849761940
Enter Qualification: ME
Enter Name: Abinash
Enter Address: Pokhara
Enter Phone No.: 9811111111
Enter Qualification: BBS
Enter Name: Rajin
Enter Address: Kathmandu
Enter Phone No.: 9822222222
Enter Qualification: BEd
There are 10 structures, which you want to view? 8

The name is Shiva.
The address is Samjur.
The phone no is 1259827348.
The qualification is ME.
Do you want to see some other records(y/n)? y
There are 10 structures, which you want to view? 10

The name is Rajin.
The address is Kathmandu.
The phone no is 1232287630.
The qualification is BEd.
Do you want to see some other records(y/n)? y
There are 10 structures, which you want to view? 1

The name is Ramesh.
The address is Samjur.
The phone no is 1259827348.
The qualification is SLC.
Do you want to see some other records(y/n)? y
There are 10 structures, which you want to view? 5

The name is Sushmita.
The address is Dumre.
The phone no is 1243398741.
The qualification is PhD.
Do you want to see some other records(y/n)?
```

Q/A?

Thank You!

Er. Shiva K. Shrestha
computer.khwopa@gmail.com