PROGRAMMING IN ANSI C: Chapter 5

DECISION MAKING AND BRANCHING

REVIEW QUESTION:

RQ-5.1: State whether the following are true or false:

(a)When if statements are nested, the last else gets associated with the nearest if without an else.

Ans: False.

(b)One if can have more than one else clause.

Ans: False.

(c)A switch statement can always be replaced by a series of if..else statements.

Ans: False.

(d)A switch expression can be of any type.

Ans: False.

(e)A program stops its execution when a break statement is encountered.

Ans: False.

(f)Each expression in the else if must test the same variable.

Ans: True.

(g)Any expression can be used for the if expression.

Ans: True.

(h)Each case label can have only one statement.

Ans: True.

(i)The default case is required in the switch statement.

Ans: True.

(j)The predicate !((x>=10) (y==5)) is equivalent to (x<10) && (y!=5).

Ans: True.

RQ-5.2:Fill in the blanks in the following statements:

(a)The …….operator is true only when both the operands are true.

Ans: logical AND (&&).

(b)Multiway section can be accomplished using an else if statement or the .
……statement.

Ans: switch.

(c)The…….. statement when executed in a switch statement causes.

immediate exit from the structure

Ans: break.

(d)The ternary conditional expression using the operator ?: code be easily

coded using ……..statement.

Ans: if…else.

(e)The expression !(x!=y)can be replaced by the expression……

Ans: x==y.

RQ-5.3:Find errors, if any, in each of the following segments:

Solution:

(a)if((x+y=z) && (y>0))

printf(" ");

Ans: Error.

Correct ans: if((x+y==z) && (y>0))

printf(" ");

(b) if (code >1)

a= b+c

else

a=0

Ans: Error.

Correct ans: if (code >1)

a= b+c;

else

a=0;

(c) if(p>0) || (q <0)

printf("Sign is negative”);

Ans: Error.

Correct ans:if((p>0) || (q <0))

printf("Sign is negative”);

RQ-5.4:The following is a segment of a program:

```
x=1;
y=1;
if(n>0)
x=x+1;
y=y-1;
printf("%d  %d", x,y);
```

what will be the values of x and y if n assumes a value of (a) 1and (b) 0.

Solution:

(a)The value of x is 2 & y is 0.

(b)The value of x & y is imaginary.

RQ-5.5:Rewrite each of the following without using compound relations:

(a) if(grade<=59&&grade>=50)

second=second+1;

Solution:

if(grade<=59)

second=second+1;

```
if(grade>=50)
    second=second+1;
```

(b)
```
if ( number>100||number<0)
      printf("Out of range");
    else
      sum=sum+number;
```

Solution:
```
    if ( number>100)
       printf("Out of range");
    else if(number<0)
    printf("Out of range");
    else
       sum=sum+number;
```

(c)
```
if (M1>60&&M2>60||T>200)
      printf("Admitted\n");
    else
      printf ("Not admitted");
```

Solution:
```
if (M1>60)
printf ("Admitted\n");
if (M2>60)
printf ("Admitted\n");
else if(T>200)
printf ("Admitted\n");
    else
```

printf (“Not admitted”);

RQ-5.6:Assuming x=10 ,state whether the following logical expressions are true or false:

(a)x==10 && x>10 && !x Ans:False.

(b)x==10 || x> 10 && !x Ans:True.

(c)x==10 && x>10 ||!x Ans:False.

(d)x==10 ||x>10 || !x Ans:True.

RQ-5.7:Find errors,if any, in the following switch related statements.Assume that the variables x and y are of int type and x=1 and y=2.

Solution:

(a)switch(y);

Ans: Error.

Correct ans: switch(y)

(b)case 10;

Ans: Error.

Correct ans: case 10:

(c)switch(x+y)

Ans:No error.

(d)switch(x) {Case 2: y= x+y; break};

Ans: Error.

Correct ans: switch(x) {Case 2: y= x+y; break;}

RQ-5.8:Simplify the following compound logical expressions:

(a) !(x<=10)

Ans:(x>10)

(b)!(x==10)||!((y==5)||(z<0))

Ans: (x>0)

(c)!((x+y==z)&&!(z>5))

(d)!((x<=5)&&(y==10)&&(z<5))

Ans: (x<z) Ans: (x>5)

RQ-5.9:Assuming that x=5, y=0,and z=1 initially ,what will be their values after executing the following code segments?

(a)if(x && y)

x=10;

else

y=10;

Output:

10

10

(b)if(x|| y ||z)

y=10;

else

z=0;

Output:

1

0

(c)if(x)

if(y)

z=10;

else

z=0;

Output:

10

0

(d)if(x ==0 || x && y)

if(!y)

```
    z=0;
    else
    y=1;
```

Output:

0

1

RQ-5.10:Assuming that x=2,y=1 and z=0 initially ,what will be their values after executing the following code segments?

(a)

```
switch(x)
{
     case  2:
                x=1;
                y=x+1;
      case  1:
                x=0;
                break;
       default:
               x=1;
               y=0;
}
```

Output:

1

0

(b)

```
switch(y)
{
```

```
case  0:
        x=0;
       y=0;
case  2:
        x=2;
        z=2;
default:
        x=1;
        y=2;
}
```

Output:

0 0 0

RQ-5.11:Find the error ,if any,in the following statements:

Solution:

(a)if(x>=10)

printf("\n");

Ans: No error.

(b)if(x>=10)

printf("OK");

Ans: No error.

(c)if(x==10)

printf ("Good");

Ans : No error.

(d)if(x=<10)

printf("Welcome");

Ans : Error.

Correct ans: if(x<=10)

Printf(“Welcome”);

RQ-5.12:What is the output of the following program?

Program:

```
main()
{
   int  m=5;
if(m<3) printf("%d", m+1);
else if (m<5) printf("%d", m+2);
else if (m<7) printf("%d", m+3);
else printf("%d", m+4);
getch();
}
```

Output:

8

RQ-5.13:What is the output of the following program?

Program:

```
main ()
{
   int  m=1;
   if( m==1)
        {
           printf ("Delhi");
           if(m==2)
          printf("Chennai");
```

```
    else
        printf("Banglore");
  }
else
Printf("END");
getch();
}
```

Output:

1

Delhi

2

Chennai

3

Banglore

RQ-5.14:What is the output of the following program?

Program:

```
main()
{
int  m;
for(m=1; m<5; m++)
printf("%d\n",(m%2) ? m : m*2);
getch();
}
```

Output:

1 4 3 8

RQ-5.15:What is the output of following program?

Program:

```
main()
{
int  m,n,p;
for(m=0; m<3;m++)
for(n=0;n<3;n++)
for(p=0;p<3;p++)
if(m+n+p==2)
goto print;
print:
printf("%d %d %d",m,n,p);
getch();
}
```

Output:

0 0 2

RQ-5.16:What will be the value of x when the following segment is executed?

```
int  x=10,y=15;
x= (x<y)? (y+x)  : (y-x) ;
```

Solution:

The value of x after execution is :-25.

RQ-5.17:What will be the output when the following segment is executed?

```
int  x=0;
```

```
if(x>=0)
if(x>0)
    printf("Number is positive");
else
    printf("Number is negative");
```

Output:

0

Number is positive

1

Number is negative

RQ-5.18: What will be the output when the following segment is executed?

Program:

```
char ch = ‘a’
switch(ch)
{
        case ‘a’:
                printf(“A”);
        case ‘b’:
                printf(“B”);
        case ‘c’:
                printf(“C”);
}
```

Output:

a

A

b

B

c

C

RQ-5.19:What will be the output of the following segment when executed?

Program:

```
main()
{
 int  x=10,y=20;
if(( x<y)|| (x+5)>10)
    printf("%d",x);
else
    printf("%d",y);
getch();
}
```

Output:

10

RQ-5.20:What will be the output of the following segment when executed?

Program:

```
main()
{
    int  a=10, b=5;
    if(a>b)
       {
         if(b>5)
              printf("%d",b);
        }
```

```
   else
       printf("%d",a);
getch();
}
```

Output:

10

CHAPTER 5

Decision Making and Branching

EXERCISE-5.1 Write a program to determine whether a given number is odd or even and print the message:

NUMBER IS EVEN or NUMBER IS ODD

(a) without using else option, and (b) with using else option.

Solution:

(a) without using else option:

```
/*……even or odd……*/

#include<stdio.h>
#include<conio.h>
 void main()
{
        int n;
        clrscr();
        printf(“Enter a number\n”)
```

```
        scanf("%d",&n);
        if(n%2==0)
                printf("NUMBER IS EVEN ");
         if(n%2==1)
                printf("NUMBER IS ODD ");
        getch();
    }
```

(b) with else option:

```
    /*……even or odd……*/

#include<stdio.h>
#include<conio.h>
    void main()
    {
        int n;
        clrscr();
        printf(“Enter a number\n”)
        scanf("%d",&n);
        if(n%2==0)
              printf("Even");
        else
               printf("Odd");
        getch();
    }
```

EXERCISE-5.2 Write a program to find the number of and sum of all integers greater than 100 and less than 200 that are divisible by 7.

Solution:

```
        /*…..number between 100-200 divisible by 7……*/

#include<stdio.h>
        #include<conio.h>
 void main()
        {
              int i,n,r,sum;
               sum=0;
               clrscr();
                for(i=100;i<=200;i++)
                {
                        r=i%7;
if(r==0)
                        {
                                printf("  %d",i);
                                sum=sum+i;
                         }
printf("Sum=%d",sum);
                }
getch();
        }
```

EXERCISE-5.3 A set of two linear equations with two unknowns x1 and x2 is given below:

ax1 +bx2=m and cx1+dx2=n

The set has unique solution

x1= and x2=

provided the determinate ad-cb is not equal to zero.

Write a program that will read the values of constants a,b,c,d,m and n and compute the values of x1 and x2 .An appropriate message should be printed if ad-cb=0.

Solution:

```
/*…….two linear equation……*/

#include<stdio.h>
#include<conio.h>
void main()
    {
        float a,b,c,d,m,n,x1,x2;
        clrscr();
        printf("Input a,b,c,d,m,n:\n");
        scanf("a=%f b=%f c=%f d=%f m=%f
n=%f",&a,&b,&c,&d,&m,&n);
        x1=(m*d-b*n)/(a*d-c*b);
        x2=(n*a-m*c)/(a*d-c*b);
        if((a*d-c*b)!=0)
            printf("x1=%f  x2= %f",x1,x2);
        else
        printf("The value is infinity.\n");
getch();
```

```
}
```

EXERCISE-5.4 Given a list of marks ranging from 0 to 100, write a program to print number of students:

(a)Who have obtained more than 80 marks, (b) who have obtained more than 60 marks,

(c)Who have obtained more than 40 marks, (d) who have obtained 40 or less marks,

(e)In the range 81 to 100, (f) in the range 61 to 80,

(g)in the range 41 to 60, and (h) in the range 0 to 40.

The program should use a minimum numbers of if statements.

Solution:

```
/*….marks obtain……*/
#include<stdio.h>
#include<conio.h>
void main()
 {
    int marks,count,a,b,c,d,i;
    a=0; b=0; c=0;d=0;
    clrscr();
    printf("Input 20 boy's marks\n");
    for(i=1;i<=20;i++)
      {
        scanf("%d",&marks);
        if(marks>80)
            a++;
        else if(marks>60)
            b++;
        else if(marks>40)
```

```
                c++;
            else if(marks<=40)
                d++;
        }
    printf("Number of students who have obtained more than 80
marks=%d\nNumber of
students who have obtained more than 60 marks=%d\n Number of students who
have obtained more than 40 marks=%d\n Number of students who have
obtained 40 or less    marks=%d",a,b,c,d);


getch();
}
```

EXERCISE-5.5 Admission to a professional course is subjects to the following conditions:

(a) Marks in Mathematics>=60

(b) Marks in Physics>=50

(c) Marks in Chemistry>=40

(d) Total in all three subjects>=200 or

Total in Mathematics and Physics>=150

Given the marks in the three subjects, write a program to process the applications to list the eligible candidates.

Solution:

```
/*……..admission for a professional course……*/


 #include<stdio.h>
```

```
#include<conio.h>
void main()
{
        int r,m,c,p,b;
 clrscr();
 printf("Input Mathmatics,Physics and Chemistry");
 scanf("%d%d%d",&m,&p,&c);
 r=m+p+c;
 b=m+p;
 if(m>=60&&p>=50&&c>=40&&r>=200&&b>=150)
      printf("The candidate is eligible");
else
      printf("The candidate is not eligible");
getch();
  }
```

EXERCISE-5.7: Shown below is a Floyd's triangle .

1

2 3

4 5 6

7 8 9 10

11……..15

79..... 91

(a) Write a program to print this triangle.

Solution:

/*…….Floyd’s triangle……..*/

```
#include<stdio.h>
#include<conio.h>
 void main()
{
      int i,j,count,n;
      clrscr();
      count=0;
      printf("\n\nHow many rows of Floyd triangle: ");
      scanf("%d",&n);
      for(i=1;i<=n;i++)
       {
          for(j=1;j<=i;j++)
             {
               count++;
               printf("%d",count);
               printf(" ");
             }
      printf("\n");
        }
 getch();
}
```

(b) Modify the program the following from of Floyd’s triangle.

1

0 1

1 0 1

0 1 0 1

1 0 1 0 1

Solution:

/*…….Floyd’s triangle……..*/

```
#include<stdio.h>
#include<conio.h>
void main()
{
    int i,j,count,n;
    clrscr();
    count=0;
    printf("\n\nHow many rows of Floyd triangle: ");
    scanf("%d",&n);
    for(i=1;i<=n;i++)
      {
         for(j=2;j<=i+1;j++)
          {
             printf("%d",(i+j)%2);
             printf(" ");
          }
        printf("\n");
      }
  getch();
```

}

EXERCISE-5.8 A cloth showroom has announced the following seasonal discounts on purchase of items:

Purchase amount	Discount	
	Mill cloth	Handloom items
0-100	5%	5%
101-200	5%	7.5%
201-300	7.5%	10.0%
Above300	10.0%	15.0%

Write a program using switch and if statements to compute the net amount to be paid by a coustomer.

Solution:

/*…….marketing of a showroom……*/

```
#define MC1 0
#define MC2 0.05
#define MC3 0.075
#define MC4 0.10
#define HI1 0.05
#define HI2 0.075
#define HI3 0.10
#define HI4 0.15
```

```
#include<stdio.h>
#include<conio.h>
void main()
 {
    float price,net,discount;
    int level,jobnumber;
    clrscr();
    input:
    printf("Enter level jobnumber and purchase amount\n");
    printf("Enter zero for level to End\n");
    scanf("%d%d%f",&level,&jobnumber,&price);
    if(level==0) goto stop;
    if(0<=price<=100)
        level=1;
    else if(101<=price<=200)
        level=2;
    else if(201<=price<=300)
        level=3;

 else
        level=4;
   switch(level)
      {
        case 1:
              discount=MC1+HI1;
              break;
         case 2:
```

```
            discount=MC2+HI2;
            break;
        case 3:
            discount=MC3+HI3;
            break;
        case 4:
            discount=MC4+HI4;
             break;
        default:
            printf("Error in level code\n");
    goto stop;
   }
 net=price-(price*discount);
 printf("Net amount=%f\n",net);
 goto input;
 stop:printf("\n\nEND OF THE PROGRAM");
 getch();
 }
```

EXERCISE-5.9 Write a program that will read the value of x and evaluate the following function

y=

using

(a) nested if statements.

(b) else if statements and

(c) conditional operator ?

Solution:

/*……evaluate the equation……..*/

(a)nested if statements:

```
#include<stdio.h>
#include<conio.h>
void main()
  {
     float x,y;
     clrscr();
     printf("Input x\n");
     scanf("%f",&x);
      if(x!=0)
          {
            if(x>0)
               printf("y=1");
            if(x<0)
                printf("y=-1");
            }
        if(x==0)
            printf("y=0");
   getch();
  }
```

(b)else if statements:

```
#include<stdio.h>
#include<conio.h>
void main()
 {
```

```
    float x,y;
    clrscr();
    printf("Input x\n");
    scanf("%f",x);
    if(x!=0)
      {
         if(x>0)
           {
              printf("1");
           }
        else
              printf("-1");
         }
     else
         printf("0");
    getch();
  }
```

(c)conditional operator:

```
#include<stdio.h>
#include<conio.h>
  void main()
  {
     clrscr();
     float y,x;
     printf("Input x\n");
     scanf("%f",&x);
     y=(x!=0)?((x>0)?1:-1):0;
```

```
printf("%d",y);
getch();
}
```

EXERCISE-5.10 Write a program to compute the real roots of a quadratic equation

ax2+bx2+c=0

The roots are given by the equtions:

x1 and x2

The program should request for the values of the constants a,b and c print the values of x1

and x2.Use the following:

(a) No solution, if both a and b are zero

(b) There is only one root if a=0(x=-c/b)

(c) There are no real roots, if b2-4ac is negative

(d) Otherwise, there no real roots

Test your program with appropriate data so that all logical paths are working as per your design. Incorporate appropriate output messages.

Solution:

/*…….roots of quadratic equation ….*/

```
#include<stdio.h>
#include<conio.h>
#include<math.h>
 void main()
  {
    float a,b,c,x,discriminant,root1,root2;
    clrscr();
```

```
    printf("Input values of a, b and c\n");
    scanf("%f %f %f",&a,&b,&c);
    discriminant=b*b-4*a*c;
    if(a==0&&b==0)
         printf("No solution\n");
    else if(a==0)
     {
         x=-(c/b);
         printf("x=%f",x);
    }
   else if(discriminant<0)
       printf("Roots are imaginary\n");
   else
    {
     root1=-b+sqrt(discriminant)/2*a;
     root2=-b-sqrt(discriminant)/2*a;
     printf("Root1=%f Root2=%f",root1,root2);
    }
    getch();
   }
```

EXERCISE-5.11: Write a program to read three integer values from the keyboard and displays the output stating that they are the sides of right-angled triangle.

Solution:

```
/*……right-angled triangle……..*/


        #include<stdio.h>
 #include<conio.h>
```

```
void main()
{
    int a,b,c,x,y,z;
    clrscr();
    printf("Input three integer values a  b  and  c\n");
    scanf("%d%d%d",&a,&b,&c);
    x=a*a;
    y=b*b;
    z=c*c;
    if(a>b&&a>c&&(x==y+z))
        printf("The values are sides of right-angled triangle");
    else if(b>a&&b>c&&(y==x+z))
        printf("The values are sides of right-angled triangle");
    else if(c>a&&c>b&&z==x+y)
        printf("The values are sides of right-angled triangle");
    else
         printf("The values are not sides of right-angled triangle");
    getch();
```

EXERCISE-5.12: An electricity board charges the following rates for the use of electricity:

For the first 200 units: 80 per unit

For the next 100 units: 90per unit

Beyond 300 units: Rs.1.00 per unit

All users are charged a minimum of Rs. 100 as meter charge. If the total amount is more than Rs.400, then an additional surcharge of 15% of total amount is charged. Write a program to read the names of users and number of units consumed and print out the charges with names.

Solution:

```
/*…….pay bill……..*/

 #include<stdio.h>
 #include<conio.h>
 void main()
 {
     float units,total,net;
     char name;
     clrscr();
     printf("Input users name and units\n");
     scanf("%s %f",&name,&units);
      {
        if(units<=200)
              total=100+0.80*units;
        else if(units<=300)
             total=100+0.90*units;
        else if(units>300)
            total=100+1.00*units;
      }
    if(total>400)
       {
        net=total+total*0.15;
        printf("Total=%f",net); }
        else
        printf("Total=%f",total);
   getch();
```

}

EXERCISE-5.13: Write a program to compute and display the sum of all integers that are divisible by 6 but not divisible by 4 and lie between 0 to 100. The program should also count and display the number of such values.

Solution:

```
/*……numbers between 0-100 divisible by 6 but not divisible by 4….*/

#include<stdio.h>
#include<conio.h>
void main()
 {
  int i,count;
  count=0;
  clrscr();
  for(i=0;i<=100;i++)
    {
      if(i%6==0&&i%4!=0)
        {
          count=count+1;
          printf("  %d",i);
         }
    }
 printf("\n");
 printf("count=%d",count);
 getch();
```

}

EXERCISE-5.14 Write an interactive program that could read a positive integer number and decide whether the number is a prime number display the output accordingly. Modify the program to count all prime numbers that lie 100 to 200. [Note: A prime number is positive integer that is divisible only by 1 or by itself]

Solution:

/*…….prime number ……*/

```
#include<stdio.h>
#include<conio.h>
void main()
{
 int i,j,count;
 count=0;
 clrscr();
 printf("\n\nSeries of prime number from 100 to 200:\n");
 for(i=100;i<=200;i++)
   {
      for(j=2;j<=i;j++)
         {
            if(i%j==0)
            break;
         }
      if(i==j)
          {
            printf("%4d\n",i);
            count+=1;
```

```
            }
      }
   printf("The countable number is: %d",count);
   getch();
   }
```

EXERCISE-5.15: Write a program read a double-type value x that represents angle in radians and a character-type variable t that represents the type of trigonometric function and display the value of

(a) sin(x), if s or S is a assigned to T,

(b) cos(x), if c or C is assigned to T, and

(c) tan(x), if t or T is assigned to T

Using (i) if…else statement and (ii) switch statement.

Solution-1:

(i)if…else statement :

```
/*……trigonometric function…….*/
#include<stdio.h>
#include<conio.h>
#include<math.h>
#include<ctype.h>
void main()
{
  int x,c,s,d,t; clrscr();
  float r,result;



  s=1;
  c=2;
```

```
 t=3;
 printf(“Input the value of x  and character value\n”);
 scanf("%d",&x);
  r=x*(180/3.1416);
  scanf("%d",&d);
 {
  if(d==1)
  result=sin(r);
  else if(d==2)
  result=cos(r);
  else if(d==3)
  result==tan(r);
else
        printf("no response.");
   }
   printf("\n%f",result);
   getch();
  }
```

Solution-2:

(ii) switch statement:

```
 /*…….trigonometric function……..*/
 #include<stdio.h>
 #include<conio.h>
 #include<math.h>
 void main()
 {
    int i,x;
```

```
float v,r;
char t;
clrscr();
printf("Input the value of x\n");
scanf("%d",&x);

 r=x*(180/3.1416);
 printf("Input charecter");
 scanf("%c",&t);
 switch(t)
  {
    case 's':
    case 'S':
              v=sin(r);
    case 'c':
    case 'C':
             v=cos(r);
    case 't':
    case 'T':
              v=tan(r);
   }
  printf("%f",v);
  getch()}
```

Reference:

http://hstuadmission.blogspot.com/2010/12/solution-programming-in-ansi-c-chapter.html