Assignment 11

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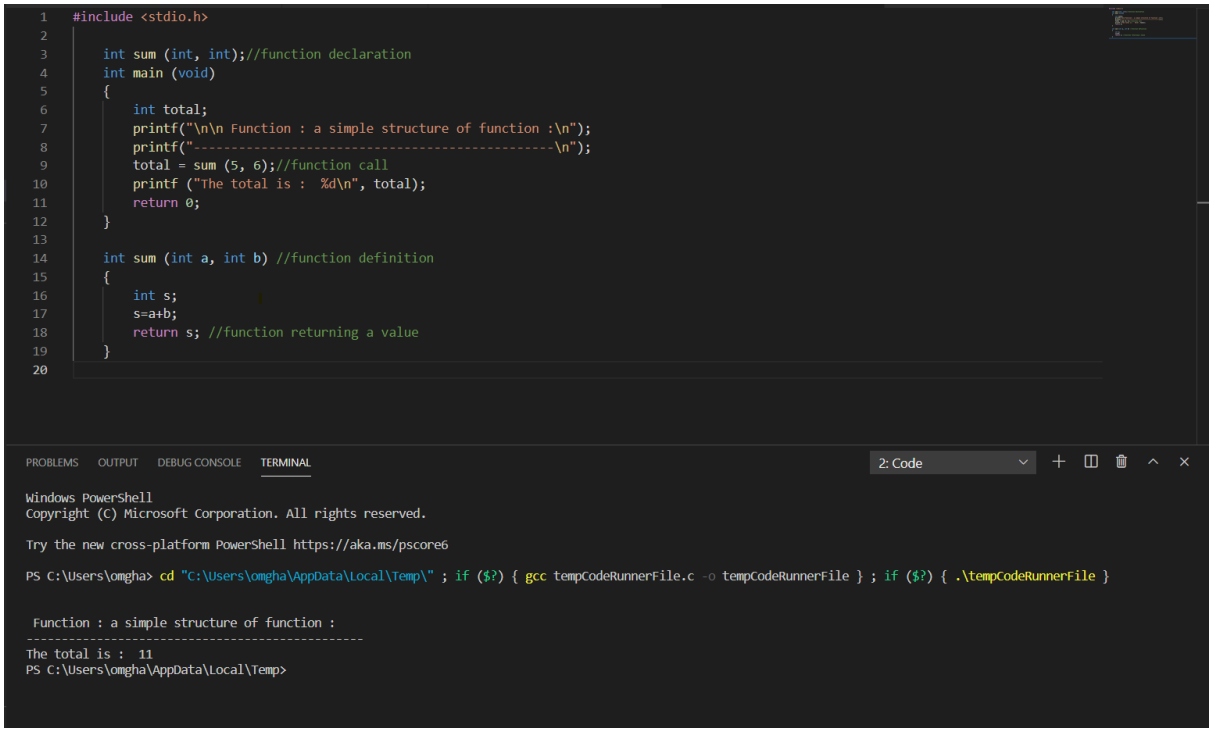
Q.1 Write a program in C to show simple structure of function



```c
#include <stdio.h>

    int sum (int, int);//function declaration
    int main (void)
    {
        int total;
        printf("\n\n Function : a simple structure of function :\n");
        printf("-----------------------------------------------\n");
        total = sum (5, 6);//function call
        printf ("The total is :  %d\n", total);
        return 0;
    }

    int sum (int a, int b) //function definition
    {
        int s;
        s=a+b;
        return s; //function returning a value
    }
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL                    2: Code

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 Function : a simple structure of function :
-----------------------------------------------
The total is :  11
PS C:\Users\omgha\AppData\Local\Temp>
```

Q.2 Write a program in C for two point- three point numerical differentiation

```c
#include<stdio.h>
#include<math.h>
float funct(float a);
int main()
{
    char choice='y';
    float f1,f2,x,h;
    printf("X =");
    scanf("%f",&x);
    do
    {
        printf("Enter value of h ? ");
        scanf("%f",&h);
        printf("\n");
        printf("The derivative is: \n");
        f1=(funct(x+h)-funct(x))/h;
        f2=(funct(x+h)-funct(x-h))/(2*h);
        printf("\n two point derivative=%f",f1);
        printf("\nthree point derivative=%f",f2);
        printf(" continue (y/n) ");
        scanf("%c",&choice);
    }while(choice=='y');

    return 0;
}
float funct(float x)
{
    return exp(x)*sin(x);
}
```

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL                                  2: Code

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PS C:\Users\omgha> cd "C:\Users\omgha\AppData\Local\Temp\" ; if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if ($?) { .\tempCodeRunnerFile }
X = 7
Enter value of h ? 0.7

The derivative is:

 two point derivative=2088.207764
three point derivative=1552.187378 continue (y/n)
PS C:\Users\omgha\AppData\Local\Temp>
```

Q.3 Write a program in C to implement trapezoidal method

```c
#include<stdio.h>
#include<conio.h>
#include<math.h>
float f(float x)
{
    return(1/(1+pow(x,2)));
}
void main()
{
    int i,n;
    float x0,xn,h,y[20],so,se,ans,x[20];
    printf("\n Enter values of x0,xn,h:\n");
    scanf("%f%f%f",&x0,&xn,&h);
    n=(xn-x0)/h;
    if(n%2==1)
    {
        n=n+1;
    }
    h=(xn-x0)/n;
    printf("\nrefined value of n and h are:%d  %f\n",n,h);
    printf("\n Y values \n");
    for(i=0; i<=n; i++)
    {
        x[i]=x0+i*h;
        y[i]=f(x[i]);
        printf("\n%f\n",y[i]);
    }
    so=0;
    se=0;
    for(i=1; i<n; i++)
    {
        if(i%2==1)
        {
            so=so+y[i];
        }
        else
        {
            se=se+y[i];
        }
    }
    ans=h/3*(y[0]+y[n]+4*so+2*se);
    printf("\nfinal integration is %f",ans);
    getch();
}
```

```
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PS C:\Users\omgha> cd "C:\Users\omgha\AppData\Local\Temp\" ; if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if ($?) { .\tempCodeRunnerFile }

 Enter values of x0,xn,h:
0 7 0.7

refined value of n and h are:10  0.700000

 Y values

1.000000

0.671141

0.337838

0.184843

0.113122

0.075472

0.053648

0.039984

0.030902

0.024576

0.020000

final integration is 1.417520
```

Q.4 Write a program in C to implement Simpson 1/3 rule

```c
#include<stdio.h>
#include<conio.h>
float f(float x)
{
    return(1/(1+x));
}
void main()
{
    int i,n;
    float x0,xn,h,y[20],so,se,ans,x[20];
    printf("\n Enter values of x0,xn,h: ");
    scanf("%f%f%f",&x0,&xn,&h);
    n=(xn-x0)/h;
    if(n%2==1)
    {
        n=n+1;
    }
    h=(xn-x0)/n;
    printf("\n Refined value of n and h are:%d %f\n",n,h);
    printf("\n Y values: \n");
    for(i=0; i<=n; i++)
    {
        x[i]=x0+i*h;
        y[i]=f(x[i]);
        printf("\n %f\n",y[i]);
    }
    so=0;
    se=0;
    for(i=1; i<n; i++)
    {
        if(i%2==1)
        {
            so=so+y[i];
        }
        else
        {
            se=se+y[i];
        }

    }
    ans=h/3*(y[0]+y[n]+4*so+2*se);
    printf("\n Final integration is %f",ans);

    getch();
}
```

```
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PS C:\Users\omgha> cd "C:\Users\omgha\AppData\Local\Temp\" ; if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if ($?) { .\tempCodeRunnerFile }

 Enter values of x0,xn,h: 2 7 0.7

 Refined value of n and h are:8 0.625000

 Y values:

 0.333333

 0.275862

 0.235294

 0.205128

 0.181818

 0.163265

 0.148148

 0.135593

 0.125000

 Final integration is 0.980885
```
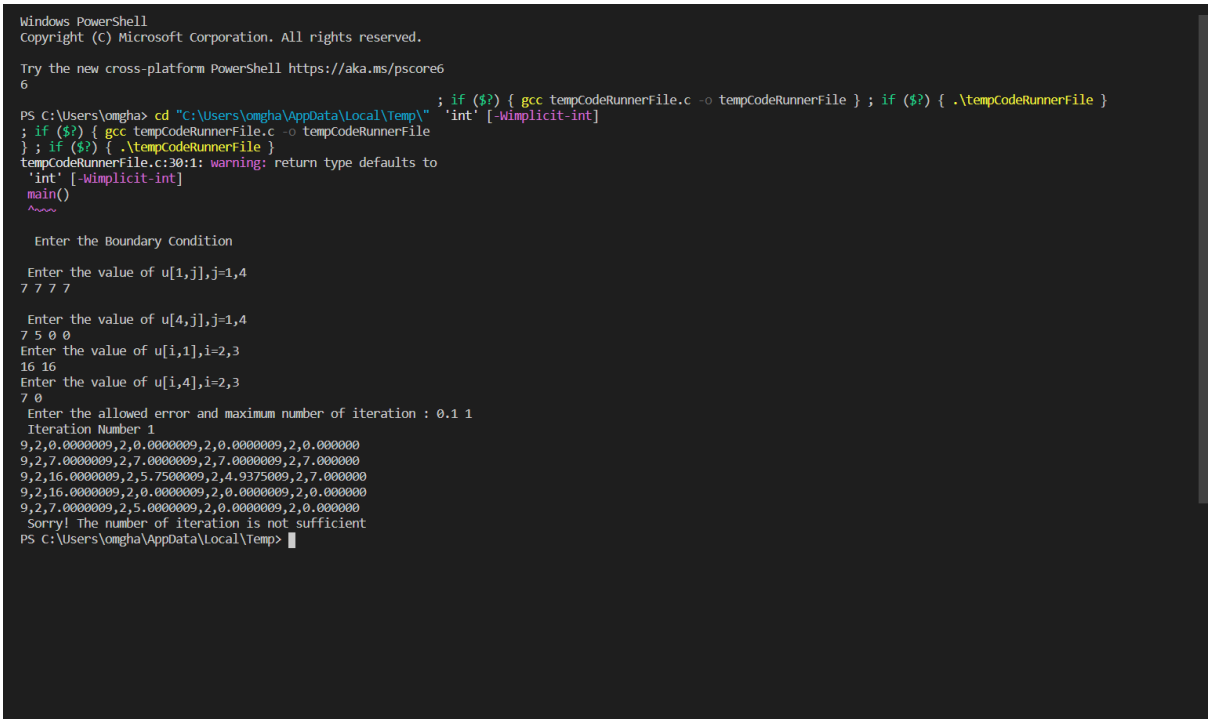

Q.5 Write a C program for solution of Laplace equation

```c
#include<stdio.h>
#include<math.h>
#define S 4
typedef float newvar[S+1][S+1];
void entrow(int i,newvar u)
{
    int j;
    printf("\n Enter the value of u[%d,j],j=1,%d\n",i,S);
    for(j=1;j<=S;j++)
    scanf("%f",&u[i][j]);
}
void entcol(int j, newvar u)
{
int i;
printf("Enter the value of u[i,%d],""i=2,%d\n",j,S-1);
for(i=2;i<=S-1;i++)
scanf("%f",&u[i][j]);
}
void oput(newvar u, int wd, int prsn)
{
    int i,j;
    for(i=i;i<=S;i++)
    {
        for(j=1;j<=S;j++)
        printf("%d,%d,%f",wd, prsn, u[i][j]);
        printf("\n");

    }
}
main()
{
    newvar u;
    float mer, ar, e, t;
   int i,j,itr, maxitr;
   for(i=1;i<=S;i++)
   for(j=1;j<=S;j++)
   u[i][j]=0;
   printf("\n  Enter the Boundary Condition\n");
   entrow(1,u); entrow(S,u);
   entcol(1,u); entcol(S,u);
   printf(" Enter the allowed error and maximum number of iteration : ");
   scanf("%f%f",&ar,&maxitr);
   for(itr=1;itr<=maxitr;itr++)
   {
       mer=0;
       for(i=2;i<S-1;i++)
       {
       for(j=2;j<=S-1;j++)
       {
           t=(u[i-1][j]+u[i+1][j]+u[i][j+1]+u[i][j-1])/4;
           e=fabs(u[i][j]-t);
           if(e>mer)
           mer=e;
           u[i][j]=t;
       }
       printf(" Iteration Number %d\n",itr);
       oput(u,9,2);
       if(mer<=ar)
       {
           printf(" After %d iteration \n The solution : \n",itr);
            oput(u,8,1);
           return 0;

       }
   }
   printf(" Sorry! The number of iteration is not sufficient");
   return 1;
}
}
```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6
; if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile } ; if ($?) { .\tempCodeRunnerFile }
PS C:\Users\omgha> cd "C:\Users\omgha\AppData\Local\Temp\" 'int' [-Wimplicit-int]
; if ($?) { gcc tempCodeRunnerFile.c -o tempCodeRunnerFile
} ; if ($?) { .\tempCodeRunnerFile }
tempCodeRunnerFile.c:30:1: warning: return type defaults to
'int' [-Wimplicit-int]
main()
^~~~
Enter the Boundary Condition
Enter the value of u[1,j],j=1,4
7 7 7 7
Enter the value of u[4,j],j=1,4
7 5 0 0
Enter the value of u[i,1],i=2,3
16 16
Enter the value of u[i,4],i=2,3
7 0
Enter the allowed error and maximum number of iteration : 0.1 1
Iteration Number 1
9,2,0.0000009,2,0.0000009,2,0.0000009,2,0.000000
9,2,7.0000009,2,7.0000009,2,7.0000009,2,7.000000
9,2,16.0000009,2,5.7500009,2,4.9375009,2,7.000000
9,2,16.0000009,2,0.0000009,2,0.0000009,2,0.000000
9,2,7.0000009,2,5.0000009,2,0.0000009,2,0.000000
Sorry! The number of iteration is not sufficient
PS C:\Users\omgha\AppData\Local\Temp>