WEST GODAVARI INSTITUTE OF SCIENCE & ENGINEERING

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AVAPADU, **PRAKASARAOPALEM** – 534 112, W.G.Dist., A.P

PROGRAMMING FOR PROBLEM SOLVING USING "C" LAB MANUAL-R20

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

I B.TECH I SEMESTER

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA

KAKINADA-533003, Andhra Pradesh, India

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1.a) Write a C program to compute the perimeter and area of a rectangle with a height of 7 inchesand width of 5 inches.

```c
#include <stdio.h>
void main( ) {
   int width,height,area,perimeter;
   height = 7;
   width = 5;
    perimeter = 2*(height + width);
   printf("Perimeter of the rectangle = %d inches\n", perimeter);

   area = height * width;
   printf("Area of the rectangle = %d square inches\n", area);
}
```

Output:

```
Perimeter of the rectangle = 24 inches
Area of the rectangle = 35 square inches
```

b) Write a program in C to check whether a number is a prime number or not using the function.

```c
#include<stdio.h>
int PrimeOrNot(int);
int main()
{
   int n1,prime;
   printf(" Input a positive number : ");
   scanf("%d",&n1);
   prime = PrimeOrNot(n1);
   if(prime==1)
       printf(" The number %d is a prime number.\n",n1);
   else
       printf(" The number %d is not a prime number.\n",n1);
   return 0;
}
int PrimeOrNot(int n1)
{
   int i=2;
   while(i<=n1/2)
   {
       if(n1%i==0)
           return 0;
       else
           i++;
   }
   return 1;
}
```

Output:

```
Input a positive number : 5
The number 5 is a prime number.
```

1. a) Write a program in C for multiplication of two square Matrices.

```c
#include<stdio.h>
void main()
{
    int a[10][10], b[10][10], c[10][10];
    int i, j, k, m1, n1, m2, n2;
    printf("Enter no. of rows and columsn for matrix A: ");
    scanf("%d%d", &m1, &n1);
    printf("Enter no. of rows and columsn for matrix B: ");
    scanf("%d%d", &m2, &n2);

    if( n1!=m2)
            printf("Multiplication is Not Possible");
    else
    {
            printf("Enter matrix A value: \n");
            for(i=0;i<m1;i++)
            {
                    for(j=0;j<n1;j++)
                    {
                            scanf("%d", &a[i][j]);
                    }
            }
            printf("Enter matrix B value: \n");
            for(i=0;i<m2;i++)
            {
                    for(j=0;j<n2;j++)
                    {
                            scanf("%d", &b[i][j]);
                    }
            }
            for(i=0;i<m1;i++)
            {
                    for(j=0;j<n2;j++)
                    {
                            c[i][j]=0;
                            for(k=0;k<n1;k++)
                            {
                                c[ i ][ j ] = c[ i ][ j ] + ( a[ i ][ k ] * b[ k ][ j ] );
                            }
                    }
            }
            printf("Multiplication is: \n");
            for(i=0;i<m1;i++)
            {
                    for(j=0;j<n2;j++)
                    {
                            printf("%d ", c[i][j]);
                    }
                    printf("\n");
            }
    }
}
```

```
output:
    Enter no. of rows and columsn for matrix A: 2 3
    Enter no. of rows and columsn for matrix B: 3 2
    Enter matrix A value:
    1 2 3
    4 5 6
    Enter matrix B value:
    1 2
    3 4
    5 6
    Multiplication is:
    22 28
    49 64
```

b) Write a C program to display multiple variables.

```c
#include <stdio.h>
void main()
{
    int a = 125;
    long ax = 1234567890;
    float x = 2.13459;
    double dx = 1.1415927;
    char c = 'W';
    unsigned long ux = 2541567890;

    printf("a = %d\n", a);
    printf("ax = %ld\n", ax);
    printf("x = %f\n", x);
    printf("dx = %f\n", dx);
    printf("c = %c\n", c);
    printf("ux =  %lu\n", ux);
}
```

Output:

```
a = 125
ax = 1234567890
x = 2.13459
dx = 1.1415927
c = W
ux = 2541567890
```

2. a) Write a program in C to find transpose of a given matrix.

```c
#include <stdio.h>
void main()
{
   int arr1[50][50],brr1[50][50],i,j,r,c;

      printf("\nInput the rows and columns of the matrix : ");
      scanf("%d %d",&r,&c);

      printf("Input elements in the first matrix :\n");
      for(i=0;i<r;i++)
       {
          for(j=0;j<c;j++)
          {
            scanf("%d",&arr1[i][j]);
          }
       }
      for(i=0;i<r;i++)
      {
          for(j=0;j<c;j++)
          {
              brr1[j][i]=arr1[i][j];
          }
      }
      printf("\n\nThe transpose of a matrix is : ");
      for(i=0;i<c;i++)
      {
           printf("\n");
          for(j=0;j<r;j++)
          {
              printf("%d\t",brr1[i][j]);
          }
      }
      printf("\n\n");
}
```

Output:

```
Input the rows and columns of the matrix : 2 2
Input elements in the first matrix :
1     2
3     4

The transpose of a matrix is :
1     3
2     4
```

b) Write a C program to calculate the distance between the two points.

```c
#include <stdio.h>
#include <math.h>

int main() {
    float x1, y1, x2, y2, gdistance;
    printf("Input x1: ");
    scanf("%f", &x1);
    printf("Input y1: ");
    scanf("%f", &y1);
    printf("Input x2: ");
    scanf("%f", &x2);
    printf("Input y2: ");
    scanf("%f", &y2);
    gdistance = ((x2-x1)*(x2-x1))+((y2-y1)*(y2-y1));
    printf("Distance between the points: %.4f", sqrt(gdistance));
    printf("\n");
    return 0;
}
```

Output:

```
Input x1: 25
Input y1: 15
Input x2: 35
Input y2: 10
Distance between the points: 11.1803
```

3. a) Write a C program that accepts 4 integers p, q, r, s from the user where r and s are positive and p is even. If q is greater than r and s is greater than p and if the sum of r and s is greater than the sum of p and q print "Correct values", otherwise print "Wrong values".

```c
#include<stdio.h>
void main( )
{
        int p, q, r, s;
        printf("Enter p value: ");
        scanf("%d",&p);
        printf("Enter q value: ");
        scanf("%d",&q);
        printf("Enter r value: ");
        scanf("%d",&r);
        printf("Enter s value: ");
        scanf("%d",&s);
        if( r>=0 && s>=0 && p%2==0 && q>r && s>p && r+s > p+q)
        {
                printf("Correct Values");
        }
        else
        {
                printf("Wrong Values");
        }
}
```

```
output:
    Enter p value: 4
    Enter q value: 20
    Enter r value: 10
    Enter s value: 22
```

b) Write a program in C to separate odd and even integers in separate arrays.

```c
#include <stdio.h>

void main()
{
   int arr1[10], arr2[10], arr3[10];
   int i,j=0,k=0,n;

     printf("Input the number of elements to be stored in the array :");
     scanf("%d",&n);

     printf("Input %d elements in the array :\n",n);
     for(i=0;i<n;i++)
        {
             scanf("%d",&arr1[i]);
          }

   for(i=0;i<n;i++)
   {
         if (arr1[i]%2 == 0)
         {
           arr2[j] = arr1[i];
            j++;
         }
         else
         {
```

```
                arr3[k] = arr1[i];
                k++;
            }
        }

    printf("\nThe Even elements are : \n");
    for(i=0;i<j;i++)
    {
            printf("%d ",arr2[i]);
    }

    printf("\nThe Odd elements are :\n");
    for(i=0;i<k;i++)
    {
            printf("%d ", arr3[i]);
    }
    printf("\n\n");
}
```

Output :

```
        Input the number of elements to be stored in the array :5
        Input 5 elements in the array :
        25 47 42 56 32

        The Even elements are :
        42 56 32
        The Odd elements are :
        25 47
```

4. a) Write a program in C to get the largest element of an array using the function.

```c
#include<stdio.h>

int findMaxElem(int [ ]);
int n;

int main()
{
    int arr1[100],mxelem,i;

        printf(" Input the number of elements to be stored in the array :");
        scanf("%d",&n);

        printf(" Input %d elements in the array :\n",n);
        for(i=0;i<n;i++)
        {
                scanf("%d",&arr1[i]);
            }
    mxelem=findMaxElem(arr1);

    printf(" The largest element in the array is : %d\n\n",mxelem);
    return 0;
}
int findMaxElem(int arr1[])
{
    int i=1,mxelem;
    mxelem=arr1[0];
    while(i < n)
            {
      if(mxelem<arr1[i])
          mxelem=arr1[i];
      i++;
    }
    return mxelem;
}
```

Output:

```
        Input the number of elements to be stored in the array :5
        Input 5 elements in the array :
                1 2 3 4 5
        The largest element in the array is : 5
```

b) Write a program in C to add two numbers using pointers.

```c
#include <stdio.h>
int main()
{
    int fno, sno, *ptr, *qtr, sum;

    printf(" Input the first number : ");
    scanf("%d", &fno);
    printf(" Input the second number : ");
    scanf("%d", &sno);

    ptr = &fno;
    qtr = &sno;

    sum = *ptr + *qtr;

    printf(" The sum of the entered numbers is : %d\n\n",sum);

    return 0;
}
```

Output:

```
Input the first number : 5
Input the second  number : 6
The sum of the entered numbers is : 11
```

5. a) Write a C program to calculate the factorial of a given number.

```c
#include<stdio.h>
void main()
{
        int n, i;
        long int f;
        printf("Enter n value: ");
        scanf("%d", &n);
        f = 1;
        for(i=1;i<=n;i++)
        {
                f = f * i;
        }
        printf("Factorial is %d", f );
}
```

```
Output-1:
    Enter n value: 5
    Factorial is 120

Output-2:
    Enter n value: 12
    Factorial is 479001600
```

b) Write a program in C to add numbers using call by reference.

```c
#include <stdio.h>
long addTwoNumbers(long *, long *);
int main()
{
   long fno, sno, sum;

   printf(" Input the first number : ");
   scanf("%ld", &fno);
   printf(" Input the second number : ");
   scanf("%ld", &sno);
   sum = addTwoNumbers(&fno, &sno);
   printf(" The sum of %ld and %ld is %ld\n\n", fno, sno, sum);
   return 0;
}
long addTwoNumbers(long *n1, long *n2)
{
   long sum;
   sum = *n1 + *n2;
   return sum;
}
```

Output:
```
Input the first number : 5
Input the second number : 6
The sum of 5 and 6  is 11
```

c) Write a program in C to swap elements using call by reference.

```c
#include <stdio.h>
void swapNumbers(int *x,int *y,int *z);
void main()
{
        int e1,e2,e3;

        printf(" Input the value of 1st element : ");
        scanf("%d",&e1);

        printf(" Input the value of 2nd element : ");
        scanf("%d",&e2);

        printf(" Input the value of 3rd element : ");
        scanf("%d",&e3);


        printf("\n The value before swapping are :\n");
        printf("%d %d %d\n",e1,e2,e3);
        swapNumbers(&e1,&e2,&e3);
        printf("\n The value after swapping are :\n");
        printf("%d  %d  %d\n",e1,e2,e3);
}
void swapNumbers(int *x,int *y,int *z)
{
   int tmp;
   tmp=*y;
   *y=*x;
   *x=*z;
   *z=tmp;
}
```

Output:

```
Input the value of 1st element : 5
Input the value of 2nd element : 6
Input the value of 3rd element : 7

The value before swapping are :
5 6 7

The value after swapping are :
7 5 6
```

6. a) Write a program in C to compare two strings without using string library functions.

```c
#include <stdio.h>
int main()
{
    char str1[100], str2[100];
    int flg=0;

    printf("\nInput the 1st string : ");
    fgets(str1, sizeof str1, stdin);

    printf("Input the 2nd string : ");
    fgets(str2, sizeof str2, stdin);
    int i=1;
    printf("\nString1: %s", str1);
    printf("String2: %s", str2);
    /* Runs till both strings are equal */
    while(str1[i] == str2[i])
    {
        if(str1[i] == '\0' && str2[i] == '\0')
            break;
        i++;
    }
    if((str1[i+1] == '\0') && (str2[i+1]=='\0'))
        flg=0;
    else if ((str1[i+1] != '\0') && (str2[i+1]=='\0'))
        flg=1;
    else flg=2;
    if(flg == 0)
    {
        printf("\nThe length of both strings are equal.\n");
    }
    else if(flg == 1)
    {
        printf("\nThe length of the first string is greater than the second string.\n\n");
    }
    else if(flg == 2)
    {
        printf("\nThe length of the second string is greater than the first string.\n\n");
    }
    return 0;
}
```

Output:

```
Input the 1st string : abc
Input the 2nd string : abc

String1: abc
String2: abc

The length of both strings are equal.
```

b) Write a program in C to print all unique elements in an array.

```c
#include <stdio.h>
void main()
{
    int arr1[100], n,ctr=0;
    int i, j, k;
        printf("Input the number of elements to be stored in the array: ");
        scanf("%d",&n);
        printf("Input %d elements in the array :\n",n);
        for(i=0;i<n;i++)
            scanf("%d",&arr1[i]);
    printf("\nThe unique elements found in the array are: \n");
    for(i=0; i<n; i++)
    {
        ctr=0;
        for(j=0,k=n; j<k+1; j++)
        {
            if (i!=j)
            {
                if(arr1[i]==arr1[j])
                        ctr++;
            }
        }
        if(ctr==0)
        {
            printf("%d ",arr1[i]);
        }
    }
        printf("\n\n");
}
```

Output:

```
Input the number of elements to be stored in the array: 4
Input 4 elements in the array :
3 2 2 5
The unique elements found in the array are:
3 5
```

7. a) Write a C program to check whether a given number is an Armstrong number or not.

```c
#include <stdio.h>
void main(){
    int num,r,sum=0,temp;
    printf("Input a number: ");
    scanf("%d",&num);
    for(temp=num;num!=0;num=num/10){
        r=num % 10;
        sum=sum+(r*r*r);
    }
    if(sum==temp)
        printf("%d is an Armstrong number.\n",temp);
    else
        printf("%d is not an Armstrong number.\n",temp);
}
```

Output:

```
Input  a number: 153
153 is an Armstrong number
```

b) Write a program in C to copy one string to another string.

```c
#include <stdio.h>
#include <string.h>
int main()
{
        char mystr[30];
        char mystr2[30] = "welcome";
        strcpy(mystr,mystr2);
        printf("%s",mystr);
        return 0;
}
```

Output:
welcome

8. a) Write a program in C to sort elements of array in ascending order.

```c
#include <stdio.h>
void main()
{
    int arr1[100];
    int n, i, j, tmp;

    printf("Input the size of array : ");
    scanf("%d", &n);
    printf("Input %d elements in the array :\n",n);
      for(i=0;i<n;i++)
        {
        scanf("%d",&arr1[i]);
        }

    for(i=0; i<n; i++)
    {
        for(j=i+1; j<n; j++)
        {
            if(arr1[j] <arr1[i])
            {
                tmp = arr1[i];
                arr1[i] = arr1[j];
                arr1[j] = tmp;
            }
        }
    }
    printf("\nElements of array in sorted ascending order:\n");
    for(i=0; i<n; i++)
    {
        printf("%d ", arr1[i]);
    }
}
```

Output:

```
Input the size of array : 5
Input 5 elements in the array :
2 7 4 5 9
Elements of array in sorted ascending order:
2 4 5 7 9
```

b) Write a program in C to print individual characters of string in reverse order.

```c
#include <stdio.h>
#include <string.h>
int main()
{
        char mystr[30]="welcome to cse";
        printf("%s",strrev(mystr));
        return 0;
}
```

Output:
    esc ot emoclew

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9. a) Write a program in C which is a Menu-Driven Program to compute the area of the various geometrical shape.

```c
#include <stdio.h>
void main ()
{
    int choice,r,l,w,b,h;
    float area;
    printf("Input 1 for area of circle\n");
    printf("Input 2 for area of rectangle\n");
    printf("Input 3 for area of triangle\n");
    printf("Input your choice : ");
    scanf("%d",&choice);
    switch(choice)
    {
        case 1:
            printf("Input radious of the circle : ");
            scanf("%d",&r);
            area=3.14*r*r;
            break;
        case 2:
            printf("Input length and width of the rectangle : ");
            scanf("%d%d",&l,&w);
            area=l*w;
            break;
        case 3:
            printf("Input the base and hight of the triangle :");
            scanf("%d%d",&b,&h);
            area=.5*b*h;
            break;
    }
    printf("The area is : %f\n",area);
}
```

Output:

```
Input 1 for area of circle
Input 2 for area of rectangle
Input 3 for area of triangle
Input your choice : 1
Input radious of the circle : 5
The area is : 78.500000
```

b) Write a program in C to convert decimal number to binary number using the function.

```c
#include<stdio.h>
long toBin(int);
void main()
{
    long bno;
    int dno;
    printf(" Input any decimal number : ");
    scanf("%d",&dno);
    bno = toBin(dno);
    printf("\n The Binary value is : %ld\n\n",bno);
}
long toBin(int dno)
{
    long bno=0,remainder,f=1;
    while(dno != 0)
    {
        remainder = dno % 2;
        bno = bno + remainder * f;
        f = f * 10;
        dno = dno / 2;
    }
    return bno;
}
```

Output:

```
Input any decimal number : 65
The Binary value is : 1000001
```

10. a) Write a program in C to display the n terms of even natural number and their sum.

```c
#include <stdio.h>
void main()
{
    int i,n,sum=0;
    printf("Input number of terms : ");
    scanf("%d",&n);
    printf("\nThe even numbers are :");
    for(i=1;i<=n;i++)
    {
        printf("%d ",2*i);
        sum+=2*i;
    }
    printf("\nThe Sum of even Natural Number upto %d terms : %d \n",n,sum);
}
```

Output:

```
Input number of terms : 5
The even numbers are :2 4 6 8 10
The Sum of even Natural Number upto 5 terms : 30
```

b) Write a C program to convert a string to a long integer.

```c
#include<stdio.h>
#include<stdlib.h>
void main ()
{
    char buffer[] = "131231235";
    char * ptr_end;
    long int i1;

    i1 = strtol (buffer,&ptr_end,10);
    printf ("\nIn decimal: %ld", i1);
}
```

Output:

```
In decimal: 131231235
```

c) Write a program in C to display the n terms of harmonic series and their sum.

1 + 1/2 + 1/3 + 1/4 + 1/5 ... 1/n terms.

```c
#include <stdio.h>
void main()
{
    int  i,n;
    float s=0.0;
    printf("Input the number of terms : ");
    scanf("%d",&n);
    printf("\n\n");
    for(i=1;i<=n;i++)
    {
            if(i<n)
                s+=1/(float)i;
            if(i==n)
                s+=1/(float)i;
    }
    printf("\nSum of Series upto %d terms : %f \n",n,s);
}
```

Output:

```
Input the number of terms : 5
Sum of Series upto 5 terms : 2.283334
```

11. a) Write a program in C to append multiple lines at the end of a text file.

```c
#include <stdio.h>
void main ()
{
  FILE * fptr;
  int i,n;
  char str[100];
  char fname[20];
  char str1;

   printf(" Input the file name to be opened : ");
   scanf("%s",fname);
   fptr = fopen(fname, "a");
   printf(" Input the number of lines to be written : ");
   scanf("%d", &n);
   printf(" The lines are : \n");
   for(i = 0; i < n+1;i++)
   {
   fgets(str, sizeof str, stdin);
   fputs(str, fptr);
   }
  fclose (fptr);
   fptr = fopen (fname, "r");
   printf("\n The content of the file %s is :\n",fname);
   str1 = fgetc(fptr);
   while (str1 != EOF)
          {
                  printf ("%c", str1);
                  str1 = fgetc(fptr);
          }
   printf("\n\n");
   fclose (fptr);
}
```

Output:

```
Input the file name to be opened : test.txt
Input the number of lines to be written : 3
The lines are :
test line 5
test line 6
test line 7

The content of the file test.txt is :

test line 1
test line 2
test line 3
test line 4

test line 5
test line 6
test line 7
```

b) Write a program in C to copy a file in another name.

```c
#include <stdio.h>
#include <stdlib.h>
void main()
{
    FILE *fptr1, *fptr2;
    char ch, fname1[20], fname2[20];

    printf(" Input the source file name : ");
    scanf("%s",fname1);

    fptr1=fopen(fname1, "r");
    if(fptr1==NULL)
    {
            printf(" File does not found or error in opening.!!");
            exit(1);
    }
    printf(" Input the new file name : ");
    scanf("%s",fname2);
    fptr2=fopen(fname2, "w");
    if(fptr2==NULL)
    {
            printf(" File does not found or error in opening.!!");
            fclose(fptr1);
            exit(2);
    }
    while(1)
    {
            ch=fgetc(fptr1);
            if(ch==EOF)
            {
                    break;
            }
            else
            {
                    fputc(ch, fptr2);
            }
    }
    printf(" The file %s copied successfully in the file %s. \n\n",fname1,fname2);
    fclose(fptr1);
    fclose(fptr2);
    getchar();
}
```

Output:

Input the source file name : test.txt
Input the new file name : test1.txt
The file test.txt copied successfully in the file test1.txt.

12. a) Write a C Program to Store Information Using Structures with Dynamically Memory Allocation

```c
#include <stdio.h>
#include <stdlib.h>
struct course {
    int marks;
    char subject[30];
};

int main() {
    struct course *ptr;
    int i, noOfRecords;
    printf("Enter the number of records: ");
    scanf("%d", &noOfRecords);

    // Memory allocation for noOfRecords structures
    ptr = (struct course *)malloc(noOfRecords * sizeof(struct course));
    for (i = 0; i < noOfRecords; ++i) {
        printf("Enter the name of the subject and marks respectively:\n");
        scanf("%s %d", (ptr + i)->subject, &(ptr + i)->marks);
    }

    printf("Displaying Information:\n");
    for (i = 0; i < noOfRecords; ++i)
        printf("%s\t%d\n", (ptr + i)->subject, (ptr + i)->marks);
}
```

Output:

```
Enter the number of records: 2
Enter the name of the subject and marks respectively:
Programming
22
Enter the name of the subject and marks respectively:
Structure
33

Displaying Information:
Programming     22
Structure       33
```

b) Write a program in C to demonstrate how to handle the pointers in the program.

```c
#include<stdio.h>
void main()
{
int m,*ptr;
m=270;
ptr=&m;
printf("The content of variable m=%d",*ptr);
*ptr=23;
Printf("\nThe content of the variable m after initialization=%d",*ptr);
}
```

Output:

```
The content of the variable m=270
The content of the variable m after initialization=23
```