ASSIGNMENT 1 – HARPARTAP SINGH

UCS540 (Data Structures & Algorithms)

Q1. Write a program in C to convert miles into kilometers (Km). Hint: 1 Mile=1.609 Km. [Use macros, relevant names, and types for variables].

Code:

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

    double miles, kilometers;

    printf("Enter the distance in miles: ");
    scanf("%lf", &miles);
    kilometers = miles * 1.609;
    printf("The distance in kilometers is: %.2lf kilometers\n", kilometers);

    return 0;
}
```

Output:

```
Enter the distance in miles: 24
The distance in kilometers is: 38.62 kilometers

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```

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Q2. Write a program to find the number of positive, negative, and zeros in a sequence of inputs (numbers) entered as data.

Code:

```
#include <stdio.h>

int main() {
    int n, i, positive, negative, zero;
    positive = negative = zero = 0;

    printf("Enter the total number of elements: ");
    scanf("%d", &n);

    printf("Enter the elements: ");
    for(i = 0; i < n; i++) {
        int num;
        scanf("%d", &num);
        if(num > 0)
            positive++;
        else if(num < 0)
            negative++;
        else
            zero++;
    }

    printf("Number of positive numbers: %d\n", positive);
    printf("Number of negative numbers: %d\n", negative);
    printf("Number of zeros: %d\n", zero);

    return 0;
}
```

Output:

```
Enter the total number of elements: 6
Enter the elements: 1,2,-3,0,4,5
Number of positive numbers: 6
Number of negative numbers: 0
Number of zeros: 0
```

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Q3. Compute the tax due based on the table below: Program
Input: Salary amount.
Program Output: Returns the tax due for 0.0 <= salary <= 150,000.00; returns -1.0 if

salary exceeds the table range.

Salary Range ($)	Base Tax ($)	Percentage of Excess
0.00–14,999.99	0.00	15
15,000.00–29,999.99	2,250.00	18
30,000.00–49,999.99	5,400.00	22
50,000.00–79,999.99	11,000.00	27
80,000.00–150,000.00	21,600.00	33

Code:

```
#include<stdio.h>

float fun(int n)
{
if(n<0){
return -1;
}

else if(n>=0 && n<15000){
return 0;

}

else if(n>=15000 && n<30000){
return (2250*18/100);

}

else if(n>=30000 && n<50000){

 return (5400*22/100);
}
```

```
    else if( n>=50000 &&  n<80000) {
       return (11000*27/100);
 }

else if(n>=80000 && n<150000){

 return (21600*33/100);

}
else {
   return -10;
}

}

int main ()
{
   int n;
   printf("Enter your salary=" );
   scanf ("%d", &n);
   printf("\n");
   printf("%.2f",fun(n));
   return 0;
}
```

Output:-

```
Enter your salary=50000

2970.00
```

Q4. Write an interactive program (menu-driven) in 'C' (using functions) to compute the area of a selected geometrical figure from a list of such figures (square, rectangle, and circle).

Code:

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

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```
#include <math.h>

void menu();
void compute_area_square();
void compute_area_rectangle();
void compute_area_circle();

int main() {
    int choice;
    while (1) {
        menu();
        printf("Enter your choice: ");
        scanf("%d", &choice);
        switch (choice) {
            case 1:
                compute_area_square();
                break;
            case 2:
                compute_area_rectangle();
                break;
            case 3:
                compute_area_circle();
                break;
            case 4:
                return 0;
            default:
                printf("Invalid choice. Please enter again.\n");
        }
    }
    return 0;
}

void menu() {
    printf("\nChoose an option:\n");
    printf("1. Square\n");
    printf("2. Rectangle\n");
    printf("3. Circle\n");
    printf("4. Exit\n");
}
```

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```
void compute_area_square() {
    float side, area;
    printf("Enter the side of the square: ");
    scanf("%f", &side);
    area = side * side;
    printf("The area of the square is: %.2f\n", area);
}

void compute_area_rectangle() {
    float length, breadth, area;
    printf("Enter the length of the rectangle: ");
    scanf("%f", &length);
    printf("Enter the breadth of the rectangle: ");
    scanf("%f", &breadth);
    area = length * breadth;
    printf("The area of the rectangle is: %.2f\n", area);
}

void compute_area_circle() {
    float radius, area;
    printf("Enter the radius of the circle: ");
    scanf("%f", &radius);
    area = 3.14159 * radius * radius;
    printf("The area of the circle is: %.2f\n", area);
}
```

Output:

```
Choose an option:
1. Square
2. Rectangle
3. Circle
4. Exit
Enter your choice: 1
Enter the side of the square: 50
The area of the square is: 2500.00

Choose an option:
1. Square
2. Rectangle
3. Circle
4. Exit
Enter your choice: 2
Enter the length of the rectangle: 20
Enter the breadth of the rectangle: 40
The area of the rectangle is: 800.00

Choose an option:
1. Square
2. Rectangle
3. Circle
4. Exit
Enter your choice: 3
Enter the radius of the circle: 30
The area of the circle is: 2827.43

Choose an option:
1. Square
2. Rectangle
3. Circle
4. Exit
Enter your choice: 4

--------------------------------
```

Q 5. Write a program to display the first n elements of the Fibonacci series.
Code:

```
#include <stdio.h>

void fibonacci(int n) {
    int t1 = 0, t2 = 1, nextTerm = 0;

    for (int i = 1; i <= n; ++i) {
```

```
        if(i == 1) {
            printf(" %d, %d, ", t1, t2);
            nextTerm = t1 + t2;
            t1 = t2;
            t2 = nextTerm;
        }

        else {
            printf(" %d, ", nextTerm);
            nextTerm = t1 + t2;
            t1 = t2;
            t2 = nextTerm;
        }
    }
}

int main() {
    int n;
    printf("Enter the number of terms: ");
    scanf("%d", &n);

    if (n <= 0) {
        printf("Number of terms should be a positive integer.");
    } else {
        printf("Fibonacci Series: ");
        fibonacci(n);
    }

    return 0;
}
```

Output:

```
Enter the number of terms: 6
Fibonacci Series:  0, 1,  1,  2,  3,  5,  8,
--------------------------------
```

Q6. Write a program to print a table book from Table X to Table Y. X, and Y are user inputs.

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Code:

```
#include <stdio.h>

void print_table(int start, int end) {
    for (int i = start; i <= end; i++) {
        for (int j = 1; j <= 10; j++) {
            printf("%d * %d = %d\n", i, j, i * j);
        }
        printf("\n");
    }
}

int main() {
    int x, y;
    printf("Enter the starting table number: ");
    scanf("%d", &x);
    printf("Enter the ending table number: ");
    scanf("%d", &y);
    print_table(x, y);
    return 0;
}
```

Output:

```
Enter the starting table number: 1
Enter the ending table number: 4
1 * 1 = 1
1 * 2 = 2
1 * 3 = 3
1 * 4 = 4
1 * 5 = 5
1 * 6 = 6
1 * 7 = 7
1 * 8 = 8
1 * 9 = 9
1 * 10 = 10

2 * 1 = 2
2 * 2 = 4
2 * 3 = 6
2 * 4 = 8
2 * 5 = 10
2 * 6 = 12
2 * 7 = 14
2 * 8 = 16
2 * 9 = 18
2 * 10 = 20

3 * 1 = 3
3 * 2 = 6
3 * 3 = 9
3 * 4 = 12
3 * 5 = 15
3 * 6 = 18
3 * 7 = 21
3 * 8 = 24
3 * 9 = 27
3 * 10 = 30

4 * 1 = 4
4 * 2 = 8
4 * 3 = 12
4 * 4 = 16
4 * 5 = 20
4 * 6 = 24
4 * 7 = 28
4 * 8 = 32
4 * 9 = 36
4 * 10 = 40
```

Q7. Write a program to compute factorial of a number using iterative approach.

Code:

```
#include <stdio.h>

long long factorial(int n) {
    long long result = 1;
    for (int i = 1; i <= n; ++i) {
        result *= i;
    }
    return result;
}
```

```
int main() {
    int number;
    printf("Enter a positive integer: ");
    scanf("%d", &number);

    if (number < 0) {
        printf("Invalid input! Factorial of a negative number is not defined.");
    } else {
        long long result = factorial(number);
        printf("Factorial of %d = %lld", number, result);
    }

    return 0;
}
```

Output:

```
Enter a positive integer: 6
Factorial of 6 = 720
```

Q 8. Write a program to swap two numbers using functions.

Code:

```
#include <stdio.h>

void swap(int *a, int *b) {
    int temp = *a;
    *a = *b;
    *b = temp;
}

int main() {
    int num1, num2;

    printf("Enter first number: ");
    scanf("%d", &num1);

    printf("Enter second number: ");
```

```
    scanf("%d", &num2);

    printf("Before swapping, num1 = %d and num2 = %d\n", num1, num2);

    swap(&num1, &num2);

    printf("After swapping, num1 = %d and num2 = %d\n", num1, num2);

    return 0;
}
```

Output:-

```
Enter first number: 10
Enter second number: 20
Before swapping, num1 = 10 and num2 = 20
After swapping, num1 = 20 and num2 = 10

--------------------------------
```

Q9. Write a function that returns the first integer between n_min and n_max entered as data to
the calling function (main).

Ans 9.

```
#include <stdio.h>

int read_number(int n_min, int n_max) {
    int number;

    printf("Enter a number between %d and %d: ", n_min, n_max);
    scanf("%d", &number);

    while (number < n_min || number > n_max) {
        printf("Invalid input! Please enter a number between %d and %d: ", n_min, n_max);
        scanf("%d", &number);
    }

    return number;
}
```

```
int main() {
    int num1, num2;

    num1 = read_number(1, 100);
    num2 = read_number(1, 100);

    if (num1 < num2) {
        printf("The first integer entered is %d\n", num1);
    } else {
        printf("The first integer entered is %d\n", num2);
    }

    return 0;
}
```

Output:

```
Enter a number between 1 and 100: 60
Enter a number between 1 and 100: 40
The first integer entered is 40

--------------------------------
```

Q10. Write nests of loops that cause the following output to be displayed.

```
0
0 1
0 1 2
0 1 2 3
0 1 2 3 4
0 1 2 3 4 5
0 1 2 3 4
0 1 2 3
0 1 2
0 1
0
```

Code:

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

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```
int main() {
    for (int i = 0; i <= 5 ;i++) {
        for (int j = 0; j <= i; j++) {
            printf("%d ", j);
        }
        printf("\n");
    }

    for (int i = 4; i >= 0; i--) {
        for (int j = 0; j <= i; j++) {
            printf("%d ", j);
        }
        printf("\n");
    }

    return 0;
}
```

Output: