CHAPTER 4 - SELECTION STRUCTURES

I. EXERCISES WITH SOLUTION

Exercise 1: Write C program inputs integer and display to the screen the given integer is odd or even.

Solution:

- **Pseudo code**

```
BEGIN

    INPUT number

    IF number MOD 2 = 0 THEN

        DISPLAY “Given number is even”

    ELSE

        DISPLAY “Given number is odd”

   END_IF

END
```

- **C code**

```
/*Program to input integer and display message to screen this
given iteger is odd or even
date writen:24.06.2008
author:
version:1*/
#include<stdio.h>
#include<conio.h>
void main(void)
{
     //declare variable
     int number;
```

```
    //Clear screen
    clrscr();
    printf("\nEnter the integer number please:");
    scanf("%d",&number);
    if(number%2==0)
         printf("\nNumber has been entered is even");
    else
         printf("\nNumber has been entered is odd");
    printf("\nPress any key to continue ... ");
    getch();//stop screen to view result
}
```

Exercise 2: Write a C program inputs gross pay and calculate tax 25% on the gross pay that exceeds a base of $5,000 , calculate nett pay. Display results to the screen.

Solution:

- **Pseudo code**

BEGIN

DEFINE CONST BASE = 5000, TAX_RATE = 0.25

INPUT grossPay

Tax = 0

IF grossPay>BASE THEN

Tax = (grossPay - BASE)*TAX_RATE

END_IF

nettPay = grossPay - Tax

DISPLAY nettPay

END

- **C code**

```
/*Program to input gross pay and calculate tax, nettpay.
Display result to the screen
date writen:24.06.2008
author:
version:1*/
#include<stdio.h>
#include<conio.h>
#define BASE 5000
#define TAX_RATE 0.25
void main(void)
{
     //declare variable
     float grossPay;
     float tax;
     float nettPay;
     //Clear screen
     clrscr();
     printf("\nEnter the gross pay please:");
     scanf("%f",&grossPay);
     tax=0.0;
     if(grossPay>BASE)
          tax=(grossPay-BASE)*TAX_RATE;
     nettPay=grossPay-tax;
     printf("\nNett pay is:%.2f",nettPay);
     printf("\nPress any key to continue");
     getch();//stop screen to view result

}
```

Exercise 3: Consider the following tax scale

GrossPay	TaxRate
0 - 5000	0
5001-20000	25%on excess over 5000
> 20000	tax on first 20,000+40% on excess over 20000

Write a program inputs gross Pay and calculate and output the Nett pay given a Gross pay.

Solution:

- **Pseudo code**

```
BEGIN

    DEFINE CONST BASE1 = 5000, BASE2 = 20000

                    TAX_RATE1 = 0.25, TAX_RATE2 = 0.4

    INPUT grossPay

    IF grossPay<=BASE1 THEN

        Tax = 0

    ELSE

        IF grossPay<=BASE2 THEN

            Tax = (grossPay - BASE1)*TAX_RATE1

        ELSE

            Tax = (BASE2-BASE1)*TAX_RATE1

                    +(grossPay -  BASE2)*TAX_RATE2

        END_IF

    END_IF

    nettPay = grossPay - Tax
```

DISPLAY nettPay

END

- **C code**

```
/*Program to input gross pay and calculate tax, nettpay.
Display result to the screen
date writen:24.06.2008
author:
version:1*/
#include<stdio.h>
#include<conio.h>
//define const
#define BASE1 5000
#define BASE2 20000
#define TAX_RATE1 0.25
#define TAX_RATE2 0.40

void main(void)
{
     //declare variable
     float grossPay;
     float tax;
     float nettPay;
     //Clear screen
     clrscr();
     printf("\nEnter the gross pay please:");
     scanf("%f",&grossPay);
     if(grossPay<=BASE1)
          tax=0.0;
     else
```

```
            if(grossPay<=BASE2)
            tax=(grossPay-BASE1)*TAX_RATE1;
            else
            tax=(BASE2-BASE1)*TAX_RATE1+(grossPay-
BASE2)*TAX_RATE2;

      nettPay=grossPay-tax;
      printf("\nTax is:%.2f",tax);
      printf("\nNett pay is:%.2f",nettPay);
      printf("\nPress any key to continue");
      getch();//stop screen to view result

}
```

Exercise 4: Write C program inputs a choice (+, - , *, /) and two integers from keyboard. Calculate as rules below:

- Choice is '+' addition two given integers.
- Choice is '-' minus two given integers.
- Choice is '*' multiply two given integers.
- Choice is '/' division two given integers.

Display result to the screen.

Solution

- **Pseudo code**

BEGIN

INPUT choice

INPUT firstNumber

INPUT secondNumber

CASE choice

'+':result = firtNumber + secondNumber

DISPLAY result

```
        '-':result =  firtNumber - secondNumber
           DISPLAY result
        '*':result =  firtNumber * secondNumber
           DISPLAY result
        '/':IF secondNumber<>0 THEN
                result =  firtNumber / secondNumber
             DISPLAY result
           ELSE
                DISPLAY errorMessage
           END_IF
        ELSE
                DISPLAY ErrorMessage
    END_CASE
  END
```

- **C code**

```
/*Program to input choice, two integers. Calculate arithmetic
base on the choice
Display result to the screen
date writen:24.06.2008
author:
version:1*/
#include<stdio.h>
#include<conio.h>
//define const
```

```
void main(void)
{
     //declare variable
     int firstNumber;
     int secondNumber;
     int result;
     char choice;
     //Clear screen
     clrscr();
     printf("\nEnter the choice please:");
     fflush(stdin);
        scanf("%c",&choice);
     printf("\nEnter the first number please:");
     scanf("%d",&firstNumber);
     printf("\nEnter the second number please:");
     scanf("%d",&secondNumber);
     switch(choice)
     {//begin of switch
          case '+':result=firstNumber+secondNumber;
               printf("\nSum of %d and %d
is:%d",firstNumber,secondNumber,result);
               break;
          case '-':result=firstNumber-secondNumber;
               printf("\nSubtraction of %d and %d
is:%d",firstNumber,secondNumber,result);
               break;
          case '*':result=firstNumber*secondNumber;
               printf("\nMultiply of %d and %d
is:%d",firstNumber,secondNumber,result);
               break;
          case '/':if(secondNumber!=0)
```

```
                {
                    result=firstNumber/secondNumber;
                    printf("\nDivision of %d and %d
is:%d",firstNumber,secondNumber,result);

                }
                else{
                    printf("\nCan not devide to zero!");
                }
                break;
          default:printf("\nInvalid choice!");

     }//end of switch
     printf("\nPress any key to continue");
     getch();//stop screen to view result

}//end main
```

Exercise 5: Using nested if and case structure to write C program inputs one month and year. Find and display to the screen the number of day of given month and year.

Solution:

Method 1: Using nested if

- **Pseudo code**

BEGIN

INPUT month

INPUT year

IF month = 1 OR month = 3 OR month = 5 OR month = 7 OR month=8 OR month = 10 OR month = 12 THEN

DISPLAY month + “has 31 days “

```
        ELSE
            IF month = 4 OR month = 6 OR month = 9 OR month = 11 THEN
                DISPLAY month + “has 30 days”
            ELSE
                IF year MOD 4 = 0 THEN
                    DISPLAY month + “has 29 days”
                ELSE
                    DISPLAY month + “has 28 days”
                END_IF
            END_IF
        END_IF
    END
```

- **C code**

```
/*Program to input month, year. Find and display number of day
of given month and year
date writen:26.06.2008
author:
version:1*/
#include<stdio.h>
#include<conio.h>

void main(void)
{
     //declare variable
     int month;
```

```
     int year;
     //Clear screen
     clrscr();
     printf("\nEnter a month please:");
     scanf("%d",&month);
     printf("\nEnter a year please:");
     scanf("%d",&year);
     if(month==1||month==3||month==7||month==8||month==10||month
==12)
          printf("\nMonth %d has 31 day",month);
     else
          if(month==4||month==6||month==9||month==11)
               printf("\nMonth %d has 30 days",month);
          else
               if(year%4==0)
                    printf("\nMonth 2 of year %d has 29
days",year);
               else
                    printf("\nMonth 2 of year %d has 28
days",year);
     printf("\nPress any key to continue");
     getch();//stop screen to view result

}
```

- **Method 2:Using case structure**
- **Pseudo code**

BEGIN

INPUT month

INPUT year

CASE month

1, 3, 5, 7, 8, 10, 12:DISPLAY month + “has 31 days”

4, 6, 9, 11: DISPLAY month + “has 30 days”

2: IF year MOD 4 = 0 THEN

DISPLAY month + “has 29 days”

ELSE

DISPLAY month + “has 28 days”

END_IF

ELSE DISPLAY “Month is invalid”

END_CASE

END

- **C code**

```
/*Program to input month, year. Find and display number of day
of given month and year
date writen:26.06.2008
author:
version:1*/
#include<stdio.h>
#include<conio.h>

void main(void)
{
     //declare variable
     int month;
     int year;
```

```
     //Clear screen
     clrscr();
     printf("\nEnter a month please:");
     scanf("%d",&month);
     printf("\nEnter a year please:");
     scanf("%d",&year);
     switch(month)
     {
          case 1:
          case 3:
          case 5:
          case 7:
          case 8:
          case 10:
          case 12:printf("\nMonth %d has 31 days",month);
          break;
          case 4:
          case 6:
          case 9:
          case 11:printf("\nMonth %d has 30 days",month);
          break;
          case 2:

               if(year%4==0)
                    printf("\nMonth 2 of year %d has 29
days",year);
               else
                    printf("\nMonth 2 of year %d has 28
days",year);
          break;
          default:printf("\nInvalid input");
     }
```

```
    printf("\nPress any key to continue");
    getch();//stop screen to view result
}
```

II. EXERCISES WITHOUT SOLUTION

Exercise 1: Consider the following electrical unit price

Consumer	Unit price
0 - 100	600
101- 150	900
151 - 200	1200
201 - 300	1500
>300	2000

Write a C program inputs number of electrical consume and calculate charge and display it to the screen.

Exercise 2: Using nested if and case structure to Write C program inputs Distance and outputs a Cost according to the following table:

Distance	Cost
0 to 99	5.00
100 to 299	8.00
300 to 599	10.00
600 to 999	12.00

Hint: using case structure, you should calculate distance/100 and use it in switch statement.

Exercise 3: Using a case structure and nested if write a C program which inputs a number and a choice ('A','B','C') where a choice of

'A' calculates the result of multiplying the number by 10

'B' calculates the result of multiplying the number by 100

'C' calculates the result of multiplying the number by 1000

Output the result to the screen.

Exercise 4: Write a C program to solve equation of second degree ($ax^2 + bx + c = 0$). a, b, c are float and input from keyboard. Display result to the screen.

Hint:

- If a = 0 and b = 0 and c = 0 then equation has uncountable root.
- if a = 0 and b = 0 and c <> 0 then equation has no root.
- if a<>0, calculate delta, and so on.

Exercise 5: Using nested if and case structure to write a C program inputs a student mark and calculates a grade according to the following scale:

Mark	Grade
90-100	A
80-89	B

70-79	C
60-69	D
<=59	F

Exercise 6: Write a C program inputs three integers. Find and display to the screen the max and min of three given integers