भारतीय सूचना प्रौद्योगिकी संस्थान गुवाहाटी

Indian Institute of Information Technology Guwahati

COMPUTER PROGRAMMING LAB (CS110)
ASSIGNMENTS AND SOLUTIONS–03

[Note: Do not use the `scanf()` function, `switch-case` and/or any loop construct.]

1. Execute the following program considering x in $\{0, 1, 5, 7, 10\}$ and y in $\{0, 1\}$. Realize the causes of different outputs:

```c
#include <stdio.h>

int main()  {
    int n = 7; // try with 0, 1, 5, 7, 10, and 20
    int condition = 0; // try with 0 and 1

    if (n == 5) {
        printf("%d\n", __LINE__);
    } else if (n % 2 == 0) {
        if (n == 10 && condition == 1) {
            printf("%d\n", __LINE__);
        } else {
            printf("%d\n", __LINE__);
        }
        printf("%d\n", __LINE__);
    } else if (condition) {
        printf("%d\n", __LINE__);
    } else if (0) {
        printf("%d\n", __LINE__);
    } else {
        printf("%d\n", __LINE__);
    }

    printf("%d\n", __LINE__);

    return 0;
}
```

2. Write a program in C to find whether a given number is odd or even. Do not use the `?:` operator.

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

```c
int main() {
    int n = 6;
    if (n % 2) printf("%d is odd.\n", n);
    else printf("%d is even.\n", n);
    return 0;
}
```

3. Write a program in C to check whether a number is divisible by either 7 or 13, or not.

```c
#include <stdio.h>

int main() {
    int n = 13;
    if (n % 7 == 0 || n % 13 == 0) printf("%d is divisible.\n", n);
    else printf("%d is not divisible.\n", n);
    return 0;
}
```

4. Write a program in C to check whether a number is divisible only by either of 7 and 13 (but not both), or not.

```c
#include <stdio.h>

int main() {
    int n = 7 * 13;
    if (n % 7 == 0) {
        if (n % 13 != 0) printf("Yes.\n");
        else printf("No.\n");
    } else {
        if (n % 13 == 0) printf("Yes.\n");
        else printf("No.\n");
    }
    return 0;
}
```

5. Write a program in C to check whether a number is negative, positive, or zero.

```c
#include <stdio.h>

int main() {
    int n = 13;
    if (n > 0) printf("%d is positive.\n", n);
    else if (n < 0) printf("%d is negative.\n", n);
    else printf("%d is zero.\n", n);
    return 0;
}
```

6. Write a program in C to find the maximum of two numbers. Do not use the ?: operator.

```c
#include <stdio.h>

int main() {
    int a = 10, b = 10;
    if (a > b) printf("%d is the maximum.\n", a);
    else printf("%d is the maximum.\n", b);
    return 0;
}
```

7. Write a program in C to check whether a character is an alphabet in English or not.

```c
#include <stdio.h>

int main() {
    char c = 'd';
    if (
        (c >= 'a' && c <= 'z') || (c >= 'A' && c <= 'Z')
    ) printf("%c is an alphabet in English.\n", c);
    else printf("It is not an alphabet in English.\n");
    return 0;
}
```

8. Write a program in C to check whether a character is an uppercase or lowercase alphabet.

```c
#include <stdio.h>

int main() {
    char c = 'D';
    if (c >= 'a' && c <= 'z') printf("%c is in lower case.\n", c);
    else if (c >= 'A' && c <= 'Z') printf("%c is in upper case.\n", c);
    else printf("It is not an alphabet in English.\n");
    return 0;
}
```

9. Write a program in C to check whether a character is a vowel or consonant.

```c
#include <stdio.h>

int main() {
    char c = 'E';
    if (
        c == 'a' || c == 'A' || c == 'e' || c == 'E' ||
        c == 'i' || c == 'I' || c == 'o' || c == 'O' ||
        c == 'u' || c == 'U'
    ) printf("%c is a vowel.\n", c);
    else if (
```

```
        (c >= 'A' && c <= 'Z') || (c >= 'a' && c <= 'z')
    ) printf("%c is a consonant.\n", c);
    else printf("It is not an alphabet in English.\n");
    return 0;
}
```

10. Write a program in C to check whether a character is an alphabet in English, a digit, or something else.

```
#include <stdio.h>

int main() {
    char c = '0';
    if (
        (c >= 'A' && c <= 'Z') || (c >= 'a' && c <= 'z')
    ) printf("Alphabet.\n");
    else if (c >= '0' && c <= '9') printf("Digit.\n");
    else printf("Something else.\n");
    return 0;
}
```

11. Write a program in C to input month as a number and print the number of days in that month.

```
#include <stdio.h>

int main() {
    int mm = 100;
    if (
        mm == 1 || mm == 3 || mm == 5 || mm == 7 || mm == 8 || mm == 10 || mm == 12
    ) printf("31.\n");
    else if (mm == 2) printf("28/29.\n");
    else if (mm >= 1 && mm <= 12) printf("30.\n");
    else printf("Invalid input.\n");
    return 0;
}
```

12. Write a program in C to check whether a triangle is valid or not. Consider all angles of the triangles as inputs.

```
#include <stdio.h>

int main() {
    double A = 30.0, B = 60.0, C = 90.0;
    double error = 1e-10;
    if (
        (A + B + C < 180 + error) && (A + B + C > 180 - error)
    ) printf("Valid");
    else printf("Invalid.\n");
```

```
    return 0;
}
```

13. Write a program in C to check whether a triangle is valid or not. Consider all sides of the triangles as inputs.

```c
#include <stdio.h>

int main() {
    double a = 30.0, b = 40.0, c = 50.0;
    if (
        a + b >= c && b + c >= a && c + a >= b
    ) printf("Valid");
    else printf("Invalid.\n");
    return 0;
}
```

14. Write a program in C to check whether a triangle is an equilateral, isosceles, or scalene triangle. Consider all sides of the triangles as inputs.

```c
#include <stdio.h>

int main() {
    double a = 30.0, b = 30.0, c = 30.0;
    if (a == b && b == c && c == a) printf("Equilateral\n");
    if (a == b || b == c || c == a) printf("Isosceles\n"); // not else if
    else if (
        a + b >= c && b + c >= a && c + a >= b
    ) printf("Scalene\n");
    else printf("Invalid\n");
    return 0;
}
```

15. Write a program in C to check whether a number is Armstrong or not.

```c
#include <stdio.h>

int main() {
    int n = 371; // 153, 370, 371, 407
    int sum = 0, digit = 0, copy = 0;
    copy = n;
    digit = n % 10;
    sum += digit * digit * digit;
    n /= 10;
    digit = n % 10;
    sum += digit * digit * digit;
    n /= 10;
    digit = n % 10;
    sum += digit * digit * digit;
    n /= 10;
```

```
    if (copy == sum) printf("Armstrong\n");
    else printf("Not Armstrong\n");
    return 0;
}
```

16. Write a program in C to input the basic salary of an employee and calculate his/her gross salary according to the following rules:

    i. If basic salary is up to 30000 rupees, he/she gets 20% HRA and 30% DA.

    ii. If basic salary is up to 60000 rupees but more than 30000 rupees, he/she gets 25% HRA and 35% DA.

    iii. If the basic salary is more than 60000 rupees, he/she gets 30% HRA and 40% DA.

```
#include <stdio.h>

int main() {
    double basic = 35000.0;
    double gross = 0.0;
    if (basic <= 30000) gross = 1.5 * basic;
    else if (basic <= 60000) gross = 1.6 * basic;
    else if (basic > 60000) gross = 1.7 * basic;
    else printf("Exception");
    printf("Gross salary: %lg\n", gross);
    return 0;
}
```

17. Write a program in C to calculate total electricity bill according to the given conditions:

    i. For the first 50 units, the cost is rupees 2.50/unit.

    ii. For the next 75 units, the cost is rupees 3.00/unit.

    iii. For the next 100 units, the cost is rupees 3.50/unit.

    iv. For units above 225, the cost is Rs. 4.00/unit.

    v. An additional surcharge of 20% applies to the total amount if more than 200 units are consumed.

```
#include <stdio.h>

int main() {
    double units = 210.0;
    double cost = 0.0;
    int isMoreThan200 = 0;
    if (units > 200.0) isMoreThan200 = 1;
    if (units > 50) {
```

```
        cost += 50.0 * 2.50;
        units = units - 50.0;
    } else {
        cost += units * 2.50;
        units = 0.0;
    }
    if (units > 75) {
        cost += 75.0 * 3.00;
        units = units - 75.0;
    } else {
        cost += units * 3.00;
        units = 0.0;
    }
    if (units > 100) {
        cost += 100.0 * 3.50;
        units = units - 100.0;
    } else {
        cost += units * 3.50;
        units = 0.0;
    }
    cost += units * 4.00;
    if (isMoreThan200) cost *= 1.20;
    printf("Cost: %lg\n", cost);
    return 0;
}
```

18. Write a program in C to find if a year is a leap year. Do not use `&&`, `||`, and `?:` operators.

```
#include <stdio.h>

int main() {
    int year = 500;
    if (year % 400 == 0) printf("%d is a leap year.\n", year);
    else if (year % 100 == 0) printf("%d is not a leap year.\n", year);
    else if (year % 4 == 0) printf("%d is a leap year.\n", year);
    else printf("%d is not a leap year.\n", year);
    return 0;
}
```

19. Write a program in C to find a minimum of three numbers. Do not use `&&`, `||`, and `?:` operators.

```
#include <stdio.h>

int main() {
    int a = 2, b = 5, c = 4;
    if (a < b) {
        if (a < c) printf("Minimum: %d\n", a);
        else printf("Minimum: %d\n", c);
```

```
    } else {
        if (b < c) printf("Minimum: %d\n", b);
        else printf("Minimum: %d\n", c);
    }
    return 0;
}
```

20. Consider a grading scheme as follows:

Marks	Grade
90 — 100	A
80 — 89	B
70 — 79	C
60 — 69	D
50 — 59	E
40 — 49	P
0 — 39	F

i. Given marks, write a program in C to find the corresponding grade. If the input marks are more than 100 or less than 0, you should assign the grade 'X' to indicate an error with the input marks.

```c
#include <stdio.h>

int main() {
    int marks = 64;
    char grade = 'X';
    if (90 <= marks && marks <= 100) grade = 'A';
    else if (80 <= marks && marks <=  89) grade = 'B';
    else if (70 <= marks && marks <=  79) grade = 'C';
    else if (60 <= marks && marks <=  69) grade = 'D';
    else if (50 <= marks && marks <=  59) grade = 'E';
    else if (40 <= marks && marks <=  49) grade = 'P';
    else if (0  <= marks && marks <=  39) grade = 'F';
    printf("Grade: %c\n", grade);
    return 0;
}
```

ii. Given marks, write a program in C to find the corresponding grade. If the input marks are more than 100 or less than 0, you should assign the grade 'X' to indicate an error with the input marks. Do not use &&, ||, and ?: operators.

```c
#include <stdio.h>

int main() {
    int marks = 64;
    char grade = 0;
```

```
    if (marks > 100) grade = 'X';
    else if (marks >= 90) grade = 'A';
    else if (marks >= 80) grade = 'B';
    else if (marks >= 70) grade = 'C';
    else if (marks >= 60) grade = 'D';
    else if (marks >= 50) grade = 'E';
    else if (marks >= 40) grade = 'P';
    else if (marks >= 0 ) grade = 'F';
    else grade = 'X';
    printf("Grade: %c\n", grade);
    return 0;
}
```

iii. Given marks, write a program in C to find the corresponding grade. If the input marks are more than 100 or less than 0, you should assign the grade 'X' to indicate an error with the input marks. Do not use any `if-else` construct.

```
#include <stdio.h>

int main() {
    int marks = 81;
    char grade = 0;
    grade = (marks > 100) ? 'X' :
            (marks >= 90) ? 'A' :
            (marks >= 80) ? 'B' :
            (marks >= 70) ? 'C' :
            (marks >= 60) ? 'D' :
            (marks >= 50) ? 'E' :
            (marks >= 40) ? 'P' :
            (marks >= 0 ) ? 'F' : 'X';
    printf("Grade: %c\n", grade);
    return 0;
}
```

21. Write a program in C to check an input character is in which category among the four:

    i. A small letter and a vowel.

    ii. A capital letter and a consonant.

    iii. A character in English but does not fall in the last two categories.

    iv. Not a character in English (maybe a special character, e.g., $).

```
#include <stdio.h>

int main() {
    char c = '$';
    if (
        ('a' <= c && c <= 'z')
```

```
        ||
        ('A' <= c && c <= 'Z')
    ) {
        if (c == 'a' || c == 'e' || c == 'i' || c == 'o' || c == 'u')
            printf("%c is a small letter and a vowel.\n", c);
        else if (
            ('A' <= c && c <= 'Z')
            &&
            (c != 'A' || c != 'E' || c != 'I' || c != 'O' || c == 'U')
        )  printf("%c is a capital letter and a consonant.\n", c);
        else
            printf("%c is a character in English but does not fall "
            "in the last two categories.\n", c);
    } else
        printf("%c is not a character in English.\n", c);
    return 0;
}
```