

1. Determine the output of the program for the following input

- i) 25 15 5
- ii) 1 5 16
- iii) -100 200 100

```
int main(){
    int a, b, c;
    scanf("%d%d%d",&a,&b,&c);
    if ( a > b || b < c && a%10 == 0 ){
        printf("C");
        if ( a + b < b + 2*c )
            printf("A");
        else
            printf("B");
    }
    else if ( c + b >= 65 || c + a%5 < 35 )
        printf("F");
    else {
        if ( c > 55 )
            printf("D");
    }
    if ( !(c >= 56 || a < 40) )
        printf("E");
    if ( a - c > c - b || b == 5 ) {
        if ( a - 3 < 20 )
            printf("H");
            printf("G");
    }
    else if ( !(a < 60) )
        printf("I");
    printf("\n");
    return 0;
}
```

2. Write a code using loop to show the following output:

->0.00 1.50 2.00 3.50 4.00 5.50 6.00 7.50 8.00 9.50<-

8

3. I was expecting the following code would show CSEDU as output. But it seems I have made one or more logical mistakes. Fix them with minimal change in the code.

7

```
#include <stdio.h>
int main() {
    char a[] = "Hello World";
    char b[] = {'C','S','E','D','U'};
    int i;
    for(i = 0; b[i] != NULL; i++){
        a[i] = b[i];
    }
    printf("%s\n",a);
    return 0;
}
```

4. Draw the matrix 'a' according to the following code:

```
#include <stdio.h>

int main() {
    int row= 4, col= 3;
    int a[row][col], i, j;
    for (i=0; i<row; ++i) {
        for (j=0; j<col; ++j) {
            a[i][j]= col*i + j;
        }
    }
    return 0;
}
```

5. Write a function `int binary_to_decimal(char bin[])` which receives a binary integer number as a string of length at most 30 (MSB is in index 0 of the string). You have to convert the binary number to decimal in the function and return the decimal number from the function. 10
6. You are given two sorted integer arrays X (consists n integers) and Y (consists m integers) in a C program (no need to write code for input). X and Y are global variables. 15  
 Write a function `void merge(int n, int m)` to merge contents of these two arrays into another array Z (which will contain n+m elements), such that the merged array Z is already sorted. You cannot sort the Z array after merging.  
 For example:  
 If, A[] = {5, 12, 19, 40} and B[] = {1, 2, 14}  
 Merged array, Z[] = {1, 2, 5, 12, 14, 19, 40}.

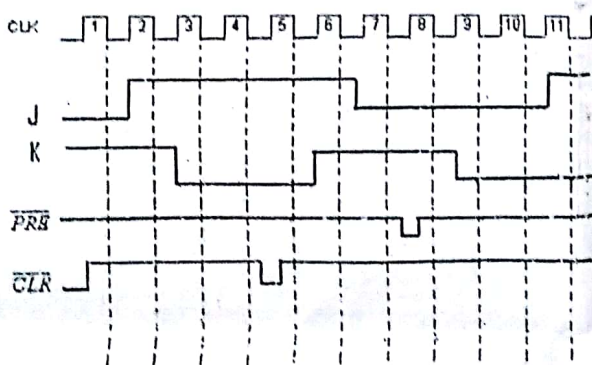
1. Realize an Ex-NOR gate using NAND gates only. 2
2. Is it possible to use an Ex-OR gate as a NOT gate? If possible show it. 1
3. Simplify the following expression using Boolean algebra 2

$$(\overline{C+D}) + \overline{A}C\overline{D} + A\overline{B}\overline{C} + \overline{A}\overline{B}CD + A\overline{C}\overline{D}$$

4. Subtract 11 from 3 in binary format using 2's complement method. 2
5. Determine the minimum expression for the following K map. 2

	$\overline{C}\overline{D}$	$\overline{C}D$	$CD$	$C\overline{D}$
$\overline{A}\overline{B}$	1	0	1	1
$\overline{A}B$	1	0	0	1
$AB$	0	0	0	0
$A\overline{B}$	1	0	1	1

6. A BCD code is being transmitted to a remote receiver. The bits are A, B, C and D where A is the MSB. The receiver circuit includes a BCD error detector circuit that examines the received code to see if it is a legal BCD code. Design the circuit to produce a HIGH for any error detection. 4
7. Explain Setting and Resetting of a NOR latch. 4
8. Determine the output of the following J-K FF. Assume the initial value of Q is 0 and the clock is NGT. 3.5



9. Add BCD numbers 457 and 829. 2
10. Consider a 4 bit parallel adder IC 7483A. How can we use it as adder/subtractor? 3.5  
Show the circuit. If the 1<sup>st</sup> input is 1010 and the 2<sup>nd</sup> input is 1001 and ADD = SUB = 1, compute and explain the output.
11. Design a multiplier which multiplies two 2 bit binary numbers AB and CD. 4  
How many outputs are required?



University of Dhaka  
Department of Computer Science and Engineering  
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Course No.: MATH 1204, Full Marks: 30

Credit: 03

Time: 90 minutes.

Answer the following questions.

1. Define Ordinary Differential Equation (ODE), order and degree of an ODE. Determine the order and degree of the following ODEs. Also mention which of these equations are linear or nonlinear in  $y$ . [6 Marks]

i.  $x^3 \frac{d^3 y}{dx^3} + x \frac{dy}{dx} - 5y = e^x$

ii.  $\frac{d^2 y}{dx^2} - x \cos y = 0$

iii.  $\left(\frac{dy}{dx}\right)^3 = \sqrt{\frac{d^2 y}{dx^2} + 1}$

2. Determine the most general function  $M(x, y)$  such that the equation,  $M(x, y)dx + (2x^2y^3 + x^4y)dy = 0$  is exact. [4 Marks]
3. Decide whether the differential equation  $(2x \cos y + 3x^2y)dx + (x^3 - x^2 \sin y - y)dy = 0$  is exact or not. Hence solve it using an appropriate method. [4 Marks]
4. What do you mean by integrating factor? Find an integrating factor of the differential equation  $x^4 \frac{dy}{dx} + 2x^3y = 1$  and hence solve it. [4 Marks]
5. Write the standard form of a Bernoulli differential equation. Solve the following Bernoulli differential equation  $x \frac{dy}{dx} - y + y^2 = 0$ . [4 Marks]
6. A 30-volt electromotive force is applied to an LR-series circuit in which the inductance is 0.1 henry and the resistance is 50 ohms. Find the current  $i(t)$ , if  $i(0) = 0$ . Determine the current as  $t \rightarrow \infty$ . (For a series circuit containing only a resistor and an inductor, Kirchhoff's second law states that the sum of the voltage drop across the inductor ( $L(di/dt)$ ) and the voltage drop across the resistor ( $iR$ ) is the same as the impressed voltage ( $E(t)$ ) on the circuit.) [4 Marks]
7. A breeder reactor converts relatively stable uranium-238 into the isotope plutonium-239. After 15 years it is determined that 0.043% of the initial amount  $A_0$  of plutonium has disintegrated. Find the half-life of this isotope if the rate of disintegration is proportional to the amount remaining. [4 Marks]