

Department of Computer Science and Engineering
First Year Second Semester B. Sc Final Examination, 2016
CSE-1201: Fundamentals of Programming

Total Marks: 60

(Answer any four (4) of the following questions)

Time: 2.5 Hours

- ✓ a) Suppose, item and product are two variables in your C program. Now write a C [2] statement to carry out the following steps. If item is nonzero, then multiply product by item and save the result in product; otherwise, skip the multiplication. In either case, print the value of product.
- b) Find the output of the program below for the following sets of inputs: [6]

- i) 10 20 30 40
- ii) 33 12 40 20
- iii) 14 7 -3 17
- iv) 18 22 14 5

```
int x, y, z, T, val;
scanf("%d %d %d %d", &x, &y, &z, &T);
if(x <= y){
    if(y > z) val = 2*y - x - z;
    else if(y == z) val = y - x;
    else val = z - x;
}
else {
    if(y > z) val = x - z;
    else if(y == z) val = x - y;
    else val = x + z - 2*y;
}
if(val > T) printf("%d is a very poor score\n", val);
else printf("%d is a very good score\n", val);
```

- c) You have written the following program to find the maximum among three integers. [3] But it's not giving expected output for some inputs. Why? Explain with example.

```
int x, y, z, max = 0;
scanf("%d %d %d", &x, &y, &z);
if(x > y && x > z) max = x;
else if(y > x && y > z) max = y;
else if(z > x && z > y) max = z;
printf("%d is the maximum\n", max);
```

- d) Write a program that determines the day number (1 to 366) in a year for a date that is [4] provided as input data. As an example, January 1, 2016, is day 1. December 31, 2015, is day 365. December 31, 2016, will be day 366, since 2016 is a leap year. A year is a leap year if it is divisible by four, except that any year divisible by 100 is a leap year only if it is divisible by 400. Your program should accept the month, day and year as integers.

2. a) Write a program that causes the following output to be displayed for N = 4: [3]

```
4
4 3 ~
4 3 2 ~
4 3 2 1 ~
4 3 2
4 3
```

4
Though the above output for N = 4, but N can be any integer 1 from 100.

- b) You are given a C program to print the first 20 multiples of 3 (for example, 3, 6, 9 ...). [3] Unfortunately, the code is not giving the expected output. Briefly describe why and propose a solution with minimum changes in the code.

```
int i;
for(i = 1; i <= 20; i += 3){
    printf("%d\n", i);
}
```

- c) A palindromic number is a positive number that is same when written forwards or backwards. Example of some palindromic number are, 121, 2222, 987789 etc. Write a C program to find the 100th palindromic number and print it. [4]

- d) What is the output of the C program below? [5]

```
int i = 0, j = 0, a = 5, b = 0;
for(i = 0, a--, b -= 6; i < a; i++, a += j ){
    for(j = 0; j > b; j--, b -= i ){
        if(i + j == 0){
            i = i * 2;
            break;
        }
        if(i < j + a){
            continue;
            j = j/2;
        }
        printf("%d %d %d %d\n", i, j, a, b);
    }
    printf("%d %d %d %d\n", i, j, a, b);
}
printf("%d %d %d %d\n", i, j, a, b);
```

3. a) Find the output of the following C program: [5]

```
int i = 0, j = 0, a[3][4];
a[0][0] = 1;
for(i = 0; i < 3; i++){
    for(j = 0; j < 4; j++){
        if(i == 0 && j == 0) continue;
        if(i == 0) a[i][j] = 2 * a[i][j - 1];
        else if(j == 0) a[i][j] = 3 * a[i - 1][j];
        else a[i][j] = 2*a[i-1][j]+3*a[i][j-1];
    }
}
for(i = 0; i < 3; i++){
    for(j = 0; j < 4; j++)
        printf("%d ", a[i][j]);
    printf("\n");
}
```

- b) Write a C program to count how many times 2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37 and 41 occurs in a given list of N integers and print them. You should follow the following output format:

2 occurs 5 time(s)

3 occurs 1 time(s)

...

41 occurs 2 time(s)

- c) Given a C program below. The code is getting Runtime error or in other words, not running normally. Find the reason and explain the reason of the error. [2]

```
int sum = 0, a[5] = {1, 2, 3, 4, 5}, i;
for(i = 0; i <= 5; i++)
    sum += a[i];
printf("%d\n", sum);
```

- d) Given two sorted integer arrays X (consists n integer) and Y (consists m integers) in a C program. 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. Note that, you cannot sort the Z array after merging. For example: suppose, A[] = {5, 12, 19, 40} and B[] = {1, 2, 14} then the merged array will be Z[] = {1, 2, 5, 12, 14, 19, 40}. [4]

4. a) Write a program to toggle characters in a given character string. For example, for given string "AbcD12E", the output should be "aBCd12e". [3]

- b) Find the output of the program below for the following sets of input: [5]

- i.. abc xyz
- ii.. abc ab
- iii.. abc Abc
- iv.. pqr pqr
- v.. abc adb

```
char a[100], b[100];
int c;
scanf("%s %s", a, b);
c = strcmp(a, b);
if(c > 0){
    strcat(a, " *** ");
    strcat(a, b);
}
else if(c < 0){
    strcat(b, " ### ");
    strcat(b, a);
    strcpy(a, b);
}
else {
    strcat(a, " && ");
    strcat(a, b);
}
printf("%s\n", a);
```

- c) The program given below was intended to copy the string b to the character array a and print it. So the output should have been "CSEDU". But actual output is not the expected one. Find the output of the program and point out the logical error of the program. [3]

```
char a[100] = "Hello World", b[100] = "CSEDU";
int i;
for(i = 0; b[i]; i++){
    a[i] = b[i];
}
printf("%s\n", a);
```

- d) Given two character string P and T, you will have to find that whether the string T [4] contains the string P or not. But there is a special property of this string searching. If the string T contains string P circularly then it will be a valid occurrence. For example, if P = "abcd" and T = "cdxyzab" then T contains P. Note that, "abcd" is circularly present in "cdxyzab".

Input	Output
3	T does not contain P
abxyzcd abcd	T contains P
xyzabcde abcd	T contains P
cdxyzab abcd	

5. a) Write output of the following program. Give short explanation of the output. [5]

```

void noChange(char a[]){
    a[3] = 'd';
}
void change(int a){
    a = 'd';
}
main(){
    int x = 5;
    char y[] = "cseuu";
    printf("%d %s\n", x, y);
    change(x);
    printf("%d %s\n", x, y);
    noChange(y);
    printf("%d %s\n", x, y);
}

```

- b) Implement any two of the following functions in C. You cannot use any library [5] functions while implementing these functions.

- i) **void string_copy(char a[], char b[])** – takes two strings and copies the content of second string to the first string.
- ii) **void string_compare(char a[], char b[])** – takes two strings and compares them. Returns 0 if the two strings are equal, -1 if the first string is smaller than second string in dictionary order, 1 otherwise.
- iii) **void string_concat(char a[], char b[])** – takes two strings and concatenates the content of the second string at the end of the first string.

- c) You are given a sentence in a string. You need to reverse the words in the sentence. [5] Two words are separated by a single space. Write a program that will reverse the words in the string without using another string or array. You cannot use STL. You need to write the code in C.

Input	Output
How are you?	you? are How
this is really easy	easy really is this

6. a) Usually we can only return a single value from the function. What are the ways of [4] returning multiple values from a function? Mention two different ways with example.
- b) Declare a structure for taking information about students. The information should [7] include roll no, name, address, father's name, mother's name and marks of 10 different subjects. Take input for 15 such students. Sort the students according to their roll no. You cannot use the sort function from STL.
- c) Write a program to copy the content of three different files to only a single file. [4]

Department of Computer Science and Engineering
First Year Second Semester B. Sc Final Examination, 2016
EEE-1202: Digital Logic Design

Total Marks: 60

Time: 2.5 Hours

(Answer any four (4) of the following questions)

1. a) Convert the decimal number 379 into a Hex number by division method. Convert this Hex number into binary one. [2]
- b) Construct an Ex-NOR gate using NAND gates only. [2.5]
- c) Determine input condition needed to produce $x = 1$ in Fig 1. [1.5]

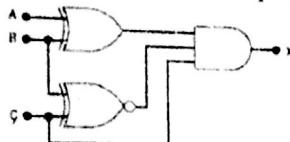


Fig.1

- d) Design a circuit for an elevator of a 10 storied building so that the elevator would stop at ground floor and all odd numbered floors except floor 1. Construct the truth table, simplify the expression and draw the resultant circuit. [5]

- e) Write down the features of SRAM. [4]

2. a) Minimize the following expression using K-map. [4]

$$f(A, B, C, D) = \sum m(4, 8, 10, 11, 12, 15) + d(9, 14)$$

- b) Minimize the above expression using QM algorithm. [11]

3. a) Mention structural and operational difference between a NOR and a NAND latch. [4]

- b) Determine The Q waveform for a J-K FF with the given input (Fig.2). Assume $J=K=1$, clock is positive edge triggered and initial value of $Q=1$. [4]

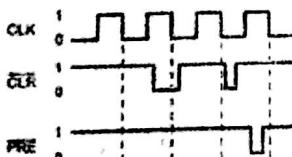


Fig.2

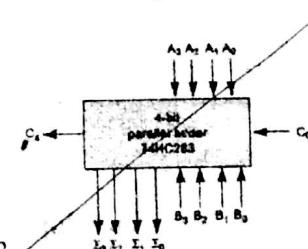


Fig.3

- c) If we want to expand word size of $2K \times 8$ PROM to $2K \times 16$ [4]

- i) How many PROM chips are required?
- ii) How many address lines are required?
- iii) How many output lines are required?

- d) Distinguish between EPROM and EEPROM. [3]

4. a) Subtract 17 from 6 in 2's complement method using binary format. Add two BCD numbers: 257 and 346. [2+2]

- b) Consider the full adder IC shown in Fig.3. How can we use it as adder/subtractor. Show the complete circuit. If $A=1010$, $B=0101$, $ADD-SUB=1$, compute the output. [6]

- c) Mention two special features of TTL NAND gate. Draw the TTL NOR gate circuit. [2+3]

5. a) Design and construct a MOD-11 synchronous counter. [6]

- b) Show Totem-pole arrangement of a TTL gate. [2]

- c) How many 74AS NAND gate inputs can be driven by a 74AS NAND gate output? [3]

	I_{OH}	I_{OL}	I_H	I_L
74	-0.4 mA	16 mA	40 μ A	-1.5 mA
74S	-1 mA	20 mA	50 μ A	-2 mA
74LS	-0.4 mA	8 mA	20 μ A	-0.4 mA
74AS	-2 mA	20 mA	20 μ A	-0.5 mA
74ALS	-0.4 mA	8 mA	20 μ A	-0.1 mA
74F	-1 mA	20 mA	20 μ A	-0.6 mA

Table 1: TTL series characteristics

[3]

- d) Explain preset and clear operation of the presettable counter shown in Fig.4. [4]

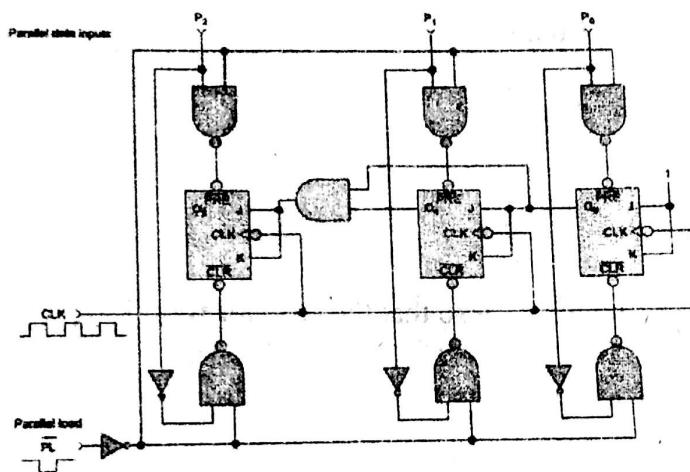


Fig.4

6. a) How many input and output lines are required for a BCD to decimal decoder? What is a priority encoder? [1]
 b) How many 74LS138 IC can be connected to form a decoder with maximum number of outputs? How many input lines are required? Show the truth table (use don't care with real value as input and IC number as output).

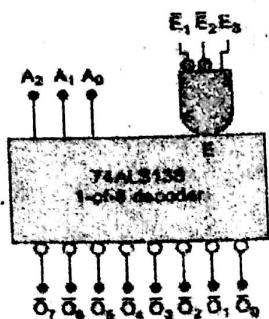


Fig.5

- c) How can we use 74LS138 as a demultiplexer? What is meant by LS?
 d) Design and construct a 4 input multiplexer.

University of Dhaka
 Department of Computer Science and Engineering
 First Year Second Semester B. Sc Final Examination, 2016
 CHM-1203: Chemistry

Total Marks: 60

Time: 2.5 Hours

(Answer any Four (4) of the following Questions)

1. a) Derive an expression for the work done in an isothermal reversible expansion of an ideal gas. [4]
 b) Show that the work done in an adiabatic process is less than that in an isothermal process, both being carried out reversibly. [4]
 c) 20 liters of hydrogen at 27°C and 50 atm. pressure expands isothermally and reversibly to 100 liters. Calculate i) the work done, ii) the final pressure and iii) heat absorbed. [4]
 d) One mole of argon is expanded reversibly and adiabatically from 22.4 liters at 25°C to 44.8 liters. Calculate i) the final temperature and ii) pressure of the gas. [3]
2. a) For a gaseous reaction, the heats of reaction at constant pressure and at constant volume may be different. Why? [2]
 b) The heat of formation of the following compounds from their elements at 17°C are, PbO: -50, 300 cal, SO₂: -70, 920 cal and PbS: 19, 300 cal. For the reaction, PbS + 1.5 O₂ = PbO + SO₂; find the heats of reaction at constant volume and at constant pressure. [3]
 c) State the Hess's law of heat summation. Calculate the heat of formation of CS₂ given that the heats of combustion of C, S, and CS₂ are, -265.10 Kcal, -70.96 Kcal and -94.3 Kcal respectively. [1+3]
 d) Define and classify molar heat capacity. Derive the relationship between C_p and C_v. [6]
3. a) State the law of mass action. Using this law derive the expression for the equilibrium constant of a reaction. [2+3]
 b) State Le Chateliers principle. Explain the effect of temperature and pressure on the ammonia synthesis reaction. [1+4]
 c) For the reaction, 2SO₃ ⇌ 2SO₂ + O₂ at equilibrium at 1000° K and 760 mm Hg, the following mole fraction data were obtained; SO₂: 0.309, SO₃: 0.338, O₂: 0.353. Calculate the values of K_p and K_c. [3]
 d) Briefly describe dynamic equilibrium. [2]
4. a) Define and explain order and molecularity of a reaction. [3]
 b) "Order of the reaction depends on the reaction conditions" – explain. [3]
 c) Derive the equation for the rate of a simple second order reaction. [4]
 d) Mention different methods of determining order of a reaction and explain one of them. [2+3]
5. a) State the postulates of Bohr's atomic model with its limitation. [5]
 b) What do you understand by the term "Quantum Number"? Name and explain the significance of each quantum number. [5]
 c) If the principal quantum number of an electron in an atom is 5, what are the possible values of other quantum numbers? [3]
 d) What is diagonal relationship? [2]
6. a) With reference to chemical bonding, explain why does i) ice float in water and ii) oil is not miscible in water. [2+2]
 b) Show all the different types of bonding present in blue vitriol (CuSO₄.5H₂O). [2]
 c) Briefly describe the electronic concept of oxidation – reduction. [3]
 d) What is buffer? How would you prepare a buffer solution? [1+2]
 e) Describe the construction of a hydrogen electrode. [3]

Department of Computer Science and Engineering
 First Year Second Semester B. Sc Final Examination, 2016
 MATH-1204: Methods of Integration, Differential Equations and Series

Total Marks: 60

(Answer any four (4) of the following questions)

Time: 2.5 Hours

1. a) Evaluate the following indefinite Integrals:

i. $\int x^n \ln x \, dx$

ii. $\int \sqrt{a^2 - x^2} \, dx$

iii. $\int dx / \{x^2(x^2 + 1)\}$

[12]

- b) Test for convergence of $\int_0^\infty dx / (e^x + 1)$

[3]

2. a) Derive the formula for Simpson's rule.

[6]

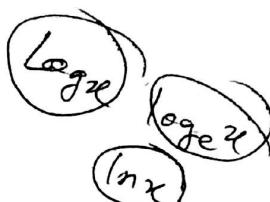
- b) Calculate the value of the integral: $\int_4^{5.2} \log x \, dx$ by

[9]

i. Trapezoidal rule

ii. Midpoint rule

iii. Simpson's rule



After finding the true value of the integral; compare the errors in the three cases.

3. a) Find a rule of general solution of differential equation $\frac{dy}{dx} + Py = Q$, where P and Q are only functions of x or constants. [5]

b) Solve $\cos^2 x \frac{dy}{dx} + y = \tan x$ [5]

- c) If the population of any country has doubled in 30 years, how long will it take to triple? Assume that increasing the population of the country is proportional to the number of people present at time t . [5]

4. a) Find the area of the region that is inside the cardioids $r = 4(1 + \cos \theta)$ and outside the circle $r = 6$. [5]

b) Find the length of the perimeter of the circle $x^2 + y^2 = a^2$ [5]

c) Find the area bounded by the hypocycloid $(x/a)^{2/3} + (y/b)^{2/3} = 1$ [5]

5. a) Define Power series, Maclaurin and Taylor polynomial. [3]

b) Find the Taylor series about $x = 1$ for $\frac{1}{x}$ and also find Maclaurin series for $\frac{1}{x}$. [6]

c) Find the Taylor series for $\sin x$ about $x = \frac{\pi}{2}$ and show that series converges to $\sin x$ for all x . [6]

6. a) Show the relation between polar and rectangular coordinates and [3]

- i. find the rectangular coordinates of the point whose polar coordinates are

$(6, 135^\circ)$

- ii. find the polar coordinates of the point whose rectangular coordinates are

$(-2, 2\sqrt{3})$

b) Find the length of the perimeter of $(x/a)^{2/3} + (y/b)^{2/3} = 1$ [6]

c) Find the surface area generated by revolving the curve $y = \sqrt[3]{3x}$, $0 \leq y \leq 2$ about the y axis. [6]