University of Dhaka
Department of Computer Science and Engineering
1st Year 1st Semester Incourse Examination, 2018
CSE-1201: Fundamentals of Programming

Total Marks: 30 Time: 1 Hour 30 Minutes

Answer all the questions

Please note that in question 1 and 6, when you write the correct version of the code, you are only allowed to change the line of codes. You are not allowed to completely delete any line of codes.

1. In the following code snippets find and list the lines, which may contain errors. After that write the correct version of the code snippet. [2+3+2]

(a)
```
include<stdio.h>
void main(){
    print(Hello World);
    return 0
}
```

(b)
```
#include<stdio.h>
int main(){
    int a,b;
    int **p=&b;
    a=&b;
    int *ptr=&p; //
    ptr=&a;
}
```

(c)
```
int main(){
    int a[][2]={{1,2},{10,20}};
    int b[2][]={{1,2},{10,20}};
    for(float i=0;i<=2;i++)
        for(float j=0;j<=2;j++)
            a[i][j]+=b[j][i];
    return 0;
}
```

2. Write a program which will allocate a (3 × 9) size double array using malloc. Now take input from user and store into the declared memory. [3.5]

3. Write a function which will take a 2D integer array and its size as parameters. This function will return 1, if all the elements have the same frequency. Otherwise return 0. [5]

4. Write a program to print the following pattern based on the pattern size N, which will always be odd. [3.5]

Output when N=3
```
..*
.###
*****
```

Output when N=5
```
....*
...###
..*****
.#######
*********
```

5. Suppose the address of first element of array **a** and **d** are **E00** and **F00** respectively. The size of int and double type data is **4 and 8 bytes** respectively. Now write the output of the following program: [5]

```
#include<stdio.h>
#include<string.h>
int main(){
    int a[]={1,5,2,8,4},*intPtr;
    double d[]={2.12,5.49,2.58,3.65,7.85,4.3,2.1};
    double *dPtr=d;
    intPtr=&a[2];
1   printf("%p %d\n",intPtr,*intPtr);
2   printf("%p %.3lf\n",dPtr,*dPtr);
    intPtr = intPtr + (int)*dPtr;
    dPtr = dPtr + *intPtr;
3   printf("%p %d\n",intPtr,*intPtr);
4   printf("%p %.3lf\n",dPtr,*dPtr);
    *intPtr += *dPtr;
5   printf("%p %d\n",intPtr,*intPtr);
    *dPtr += *intPtr;
6   printf("%p %.3lf\n",dPtr,*dPtr);
}
```

6. Your friend writes the following programs. However, her computer is broken and thus she needs your help to check whether her programs working properly. If her programs working properly then inform her that there is no problem. Otherwise, list the lines of code, which may contain any bug. After that write the correct version of the program so that it will work according to the expected behavior. [4+2]

(a) The following code was written to reverse a string.

```
#include <string.h>
#include <stdio.h>
char* reverse(char *input) {
    int len = strlen(input);
    char output[len];
    for (int i = 0; i < len; i++) {
        output[len - i] = input[i];
    }
    return output;
}
int main(){
    char s[100];
    scanf("%s",s);
    printf("%s",reverse(s));
    return 0;
}
```

(b) The following function will return the quotient of two integers.

```
int quotient(long int a, long int b){
    return a/b;
}
```

University of Dhaka
Department of Computer Science & Engineering
1st Year 2nd Semester In-Course Examination 2018
EEE- 1202 Digital Logic Design

Time: 1.5 hour Total Marks:20

(Answer all of the questions. Marks are indicated at the right margin within '[ ]')

1. A) Reduce the following Boolean expression to four literal expression using identities. You have to show the identity you are using in each step. [2]

$$(X' + Y + Z')' + XY'Z' + YZ + XYZ$$

B) Add $(3421)_5$ and $(7865)_9$. Present the result in base 7. $(3421)_5 + (7865)_9 = (?)_7$ [2]

C) Find the complement of the following Boolean function and reduce them to two number of literals. Your result should be presented in a standard sum-of-products (SOP) form. [3]

$$F(X, Y, Z) = (X'Y') + (X'Y) + (X Z')$$

2. A) Find the simplified product-of-sums (POS) for the following Boolean function F together with the don't-care conditions *d*: $F(A, B, C, D) = \sum_m(2, 4, 7, 8, 9, 12, 15) + \sum d(5, 6, 13)$ [4]

B) Write simplified expressions in sum-of-products (SOP) and product of sum (POS) forms for the Boolean function using K-map. [4]

$$F(A, B, C, D) = (A'+B'+C)(B+D)$$

C)For the following Boolean expression:

$$F(A, B, C, D) = \sum_m(1, 2, 3, 5, 7, 8, 10, 12, 13, 14)$$ [5]

Find (i) All Prime Implicants, (ii) Essential Prime Implicants and (iii) Minimum Expression.

For the minimum expression of 2(C), draw the logic gate diagram and find out the values of Literal cost (L), Gate input cost (G) and Gate input cost with NOTs (GN).

Name:

Roll:

University of Dhaka
Department of Computer Science and Technology
In-course Assessment
1st Year 2nd Semester B.Sc. Honors Examination 2018
Course no. CHE1203 : Chemistry (3 Credits)
Time: 1 hour 30 minutes; Full Mark: 20 (Total 100/5)

Mark Obtained

1. Arrange the following radiation according to their increasing frequency: X-ray, infrared, ultraviolet, γ-ray, microwave and radio wave radiation. 2

γ-ray > X-ray > Ultraviolet > Microwave > Radio wave

2. Mention the name and transitions involved for visible radiation in the emission spectrum of hydrogen. 2

1. Lyman series (~~n=1 to others~~ to n=1) (UV ray) 5. Pfund series (to n=5)
2. Balman series (to n=2) (Visible ray)
3. Paschen series (to n=3) (IR ray)
4. Brackett series (to n=4) (IR ray)

for

3. State Planck's theory of quantization of energy in your own words. 3

Plancks' theory states that when a compound ~~radi heate~~ radiates energy it does so in discrete units called quanta.

$E = n(h\nu)$

4. *3d orbital exists, but not 2d.* Explain briefly. 3

2nd shell has only 2 possible sub-shells s & p. (upto n-1)
(l=0) (l=1)

3rd shell has 3 possible subshells s, p, d (upto n-1)
(l=0)(l=1)(l=2)

5 Show the values of different quantum numbers for 4*d* orbital 5

n	l	m	s
4	2(d)	-2	$\pm 1/2$
		-1	$\pm 1/2$
		0	$\pm 1/2$
		+1	$\pm 1/2$
		+2	$\pm 1/2$

(Total 10 possible states)

6. State Heisenberg uncertainty principle and express mathematically. 4

The product of the uncertainty of ~~displacement &~~ position and momentum cannot be less than $h/4\pi$.

$\Delta x \Delta p \geq \frac{h}{4\pi}$

7. Show the electron configuration of - 3
Mn(Z=25): $1s^2\ 2s^2\ 2p^6\ 3s^2 3p^6\ 3d^5\ 4s^2$
Cu(Z=29): $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^1$
Fe^{3+}(Z=26): $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^0$

8. Define- *Orbital.* 3

The region of space around the nucleus where the probability of find the electrons is 95% is called its orbital.

9. Draw the shapes of the following orbitals: 4

$3d_{x^2-y^2}$ $3d_{xz}$ $3d_{z^2}$ $2p_x$

10. *Henry Moseley discovered a correlation between atomic number and the frequency of X rays generated by bombarding an element with high-energy electrons. How did it help* to establish modern periodic law? 4

The old periodic law by Mendeleev was based on atomic mass which caused discrepancy (Ar was placed after K) But if arranged according to atomic number (Ar(18) = 39.8, K(19) = 39.1) these were sorted out, [Ar(18), K(19)] So it helped set up the modern periodic law.

11. *Zn, Cd and Hg are neither representative elements not transition elements.* Justify. 3

Transition elements are elements with have a partially filled d-orbital or can readily produce an ion with a partly filled d-orbital. Moreover Zn, Cd, Hg are neither transition (fulfilled d orbital) non representative element (doesn't has only s & p orbital is valence shell)

12. What is the general electron configuration of noble gases? Name two compounds formed by Xenon. 2+1

The general valence electron configuration is ns^2np^6 (octet)
e.g. XeF_4, XeF_6

13. Classify the following materials as metal, non-metal and metalloids: tin, carbon, silicon, mercury. 2

Metal: Tin, mercury
Non-metal: Carbon
Metalloids: Silicon

14. *What is diagonal relationship. Name two pairs of elements that show diagonal relationship?* 2+2

Diagonal relationship is the phenomenon that elements placed in the same diagonal on the periodic table show similar characteristics.

Li Be
Na Mg Al e.g. Li & Mg, Be & Al

15. What is *electronegativity*. Give an example of a polar bond and explain in terms of electronegativity. 2+3

Electronegativity is the tendency of atoms to pull the covalently shared electrons towards itself.

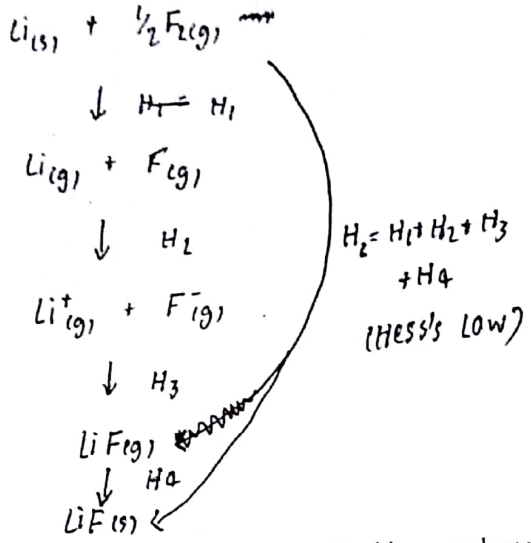
$H^{\delta+} \rightarrow Cl^{\delta-}$

Due to high electronegativity Cl pulls the shared e⁻ becoming partially negative thus forming a polar molecule. and H partially +ve

16. Explain- the very high values of ionization energies associated with noble gases.

Noble gases have the most stable electron configuration in the periodic table (ns^2np^6 : octet, except He).
So it's harder to extract electrons thus requiring more energy

17. Schematically show the Born-Haber cycle for the formation of an ionic compound, LiF. Define- *lattice energy*. 5+1



Lattice energy: The enthal change of energy ~~when forming 1 mole of solid crystal~~ associated with forming one mole solid crystal.

18. Carbon tetrachloride is a colorless liquid with a very low melting point (-23°C) and low boiling point (76 °C) that does not conduct electricity in the liquidstate or in aqueous solution.

(i) What type of bonding is there in CCl_4? Show how octet rule is applied in the formation of bonding in CCl_4. 1+3

There is covalent bond. C ($1s^2 2s^2 2p^2$) requires 4 e^- to get octet, while Cl ($1s^2 2s^2 2p^5$) requires 1. So 1 C and 4 Cl share to form CCl_4

3

(ii) Justify the mentioned properties of CCl_4.

As it is a covalent compound, it only has weak vander waals force which is the reason for low melting & boiling points. Moreover no free electron means no conduction. 3

(iii) What is wrong with or ambiguous to state " molecular weight of NaCl is 58.5 $gmol^{-1}$"?

NaCl is an ionic compound where the form complex crystal networks and the term "molecule" is not applicable.

20. *The police often use a device called a breathalyzer to test drivers suspected of being drunk.* What is the chemical basis of this device? Show appropriate reactions. 5

$ROH \xrightarrow[\text{(oxidation)}]{[O]} RCOOH$ (alcohol) ~~(by measuring amount we can get measured through electrical means)~~

By measuring amount of oxidation we can calculate the amount of alcohol. Thus indicating level of drunkness.

21. Identify conjugate acid-base pair in the reaction, $CN^- + H_2O \rightleftharpoons HCN + OH^-$ and justify the choice. 3

1. CN^- (based), HCN (conjugate acid) ; $CN^- + H^+ \rightarrow HCN$

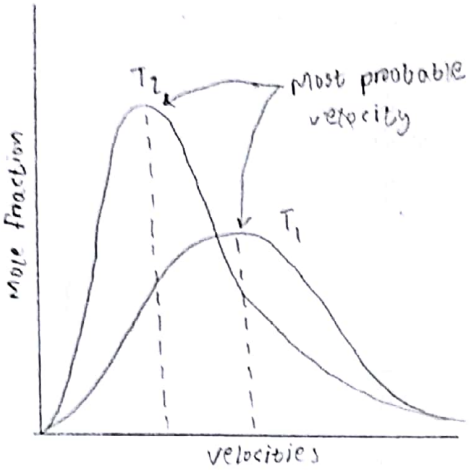
2. H_2O (acid), OH^- (conjugate base) ; $H_2O \rightarrow OH^- + H^+$

22. The OH^- ion concentration of a blood sample is 2.5×10^{-7} *M*. What is the pH of the blood? 3

$pH = -\log[H^+]$ $pOH = -\log[OH^-] = 6.602059$

$\therefore pH = 14 - pOH = 7.397\,9$

23 Draw Boltzmann distribution curve for molecular velocities at two different temperatures, T_1 and T_2 ($T_1 > T_2$) for a gas. Identify the characteristic features of these graphs, and the effect of increasing the temperature on the molecular speeds. 3+3



Due to temp. increase, the most probable velocity shifts to the right (vel increase)
Moreover ~~higher velocities represent~~ probability of molecules having higher velocities increase. Thus the curve flatens out.
The area under the curve remains same (same no. of molecules)

24. A 0.5 mole sample of He(g) and a 0.5 mole sample of Ne(g) are placed separately in two 10.0 L rigid containers at 25 °C. Each container has a pinhole opening. Which of the gases, He(g) or Ne(g), will escape faster through the pinhole and why? 3

He(g) will escape faster because it is lighter than Ne(g) (same amount). ~~According to Graham's law~~ So the molecules have greaber velocities at same temperature.

25. Write down the mathematical expressions for ideal gas equation. Write down van der Waals equation and mention the significances of van der Waals constants for *a* and *b* to differentiate ideal and real gases 2+3

$pV = nRT$ (ideal)

$\left(p - \frac{n^2a}{V}\right)(V - nb) = nRT$ (Vander Waals)

a is the pressure correction constant for accounting the inter molecular interaction
b is the connection ~~of~~ for the volume of the molecules themselves

26. What is SCUBA diving? What would happen if a diver rose to the surface from a depth of 20 ft rather quickly without breathing? Discuss with the help of applicable gas laws. 5

When a SCUBA diver rises to the surface very fast the water pressure reduces quickly. Due to this by Boyle's Law the lung expands rapidly and may explode.

~~$P \propto V$~~ $V \propto \frac{1}{P}$

Water pressure, $P \propto h$ (height of water ~~3~~ above)

University of Dhaka

1st year 2nd Semester Incourse Exam- 2018

Subject: CSE

Course Name: Methods of Integration, Differential Equations and Series

Course No.: MATH 1204

Full Marks: 25 **Time: 1 Hour**

N.B.: Answer any 5 (Five) questions.

1. Evaluate (i) $\int e^x \cos x\, dx$ by repeated integration by parts.

   (ii) $\int x^2 \sqrt{x-1}\, dx$ by tabular method.

2. Find the area of the ellipse $\frac{x^2}{4} + \frac{y^2}{9} = 1$.

3. Evaluate (i) $\int \frac{\sqrt{x^2-25}}{x} dx$ (ii) $\int \tan^2 x \sec^4 x\, dx$

4. (a) Find the arc length of the curve $y = x^{\frac{3}{2}}$ from (1, 1) to $(2, 2\sqrt{2})$.

   (b) Find the area of the surface that is generated by revolving the portion of the curve $y = x^3$ between $x = 0$ and $x = 1$ about the x-axis.

5. (a) Define polar coordinate system. Change the coordinates: (i) $(-2, -2\sqrt{3})$ and $\left(6, \frac{2\pi}{3}\right)$.

   (b) Find the area of the region in the first quadrant that is within the cardioid $r = 1 - \cos\theta$.

6. Define improper integral. Evaluate (i) $\int_0^x (1-x)\ e^{-x}\, dx$ (ii) $\int_{-\infty}^{\infty} \frac{1}{1+x^2}\ dx$.

7. Integrate any two of the following

   (i) $\int \frac{1}{2x^2+x+1} dx$ (ii) $\int \frac{1}{\sqrt{(x-1)(2-x)}} dx$ (iii) $\int_0^{\frac{\pi}{2}} \frac{dx}{3+2\cos x}$