MANDALAY TECHNOLOGICAL UNIVERSITY
DEPARTMENT OF MECHATRONIC ENGINEERING
First Semester Re-Examination of Second Year
McE 21019 Computer System Architecture and Programming I

Date: Time: 9:00 To 12:00 AM

Answer **ALL** Questions.

Sr.No.	Solution	Mark

1. (a)	What is the output of the following statements? Suppose a and b are int variables, c is a double variable, and a = 13, b = 5, and c = 17.5.
	  i. cout << a / static_cast<double>(b) + 2 * c<< endl;
	  ii. cout << static_cast<int>(c) % 5 + a – b<< endl;
	  iii. cout << 13.5 / 2 + 4.0 * 3.5 + 18 << endl;
	  iv. cout<< a / 4.0 + 15 % 4 - 3.5<<endl;
	  v. cout<< static_cast<int>(b / a + c – 6.3) + b <<endl;
	
	Solution:
	   1. 37.6
	   2. 10
	   3. 38.75
	   4. 2.75
	   5. 16
		5 marks

1. (b).	What is the output of the following nested for loop statements?
	  int i, j;
	  for (i = 1; i <= 9; i++)
	  {
	  for (j = 1; j <= (9 - i); j++)
	  cout << " ";
	  for (j = 1; j <= i; j++)
	  cout << setw(1) << j;
	  for (j = (i +1); j >= 1; j--)
	  cout << setw(1) << j;
	  cout << endl;
	  }
	
	         121
	        12321
	       1234321
	      123454321
	     12345654321
	    1234567654321
	   123456787654321
	  12345678987654321
	 12345678910987654321
		5 marks

1. (c)	Rewrite the following expressions using an if...else statement. (Assume that all variables are declared properly.)
	  i. (x < 5) ? y = 10 : y = 20;
	  ii. (fuel >= 10) ? drive = 150 : drive = 30;
	  iii. (booksBought >= 3) ? discount = 0.15 : discount = 0.0;
		5 marks

	1. *if (x<5) y=10;* *else y=20;* 2. *if (fuel>=10) drive=150;* *else drive=30;* 3. *if(booksBought>=3) discount = 0.15;* *else discount = 0.0;*	
1. (d)	Suppose that **overSpeed** and **fine** are **double** variables. Write the program statements that assigns a value to **fine** as follows: If $0 <$ **overSpeed** $<= 8$, the value assigned to **fine** is \$20.00; if $8 <$ **overSpeed** $<= 15$, the value assigned to **fine** is \$65.00 if $15 <$ **overSpeed** $<= 25$, the value assigned to **fine** is \$150.00; if **overSpeed** > 25, the value assigned to **fine** is \$125.00 plus \$25.00 per mile over 25. **Solution:** *If (0 < overSpeed && overSpeed <=8)* *fine = 20.0;* *else if (8 < overSpeed && overSpeed <=15)* *fine = 65.0;* *else if (15 < overSpeed && overSpeed <=25)* *fine =150.0;* *else* *fine = 125.0 + (25.0 * (overSpeed – 25))*	**5 marks**
2. (a)	Rewrite the following as a **for loop**. What is the output of this loop? *int i = 0, value = 0;* *while (i <= 10)* *{* *if (i % 2 == 0 && i <= 7)* *value = value + i * i;* *else if (i % 2 == 0 && i > 5)* *value = value + i;* *else* *value = value - i;* *i = i + 1;* *}* *cout << "value = " << value << endl;* **Solution:** *int i, value = 0;* *for(i=0;i<=10;i++)* *{* *if (i % 2 == 0 && i <= 7)* *value = value + i * i;* *else if (i % 2 == 0 && i > 5)* *value = value + i;* *else* *value = value - i;* *}* *Cout<<"value = "<< value <<endl;*	**10 marks**

2. (b)	One metric ton is approximately 2205 pounds. Write a program that prompts the user to input the amount of rice, in pounds, in a bag. The program outputs the number of bags needed to store one metric ton of rice. The program should then display the result and ask whether the user wants to continue.
	
	Solution:
	
	``cpp
	#include<iostream>
	#include<iomanip>
	using namespace std;
	int main()
	{
	        double pound,ton=2205.0,amount;
	        int noOfbag;
	        char ch;
	
	        do
	        {cout<<"Enter amount of rice in pound: ";
	        cin>>amount;
	        noOfbag=static_cast<int>((ton/amount)+0.5);
	        cout<<"Number of bags : "<<noOfbag<<endl<<endl;
	        cout<<"Do it again (y or n):";
	        cin>>ch;
	        }while(ch!='n');
	
	return 0;
	}
	``
		10 marks

3.	A bank in your town updates its customers' accounts at the end of each month. The bank offers two types of accounts: savings and checking. Every customer must maintain a minimum balance. If a customer's balance falls below the minimum balance, there is a service charge of $10.00 for savings accounts and $25.00 for checking accounts. If the balance at the end of the month is at least the minimum balance, the account receives interest as follows:
	
	  a. Savings accounts receive 4% interest.
	  b. Checking accounts with balances of up to $5,000 more than the minimum balance receive 3% interest; otherwise, the interest is 5%.
	
	Write a program that reads a customer's account number (int type), account type (char; s for savings, c for checking), minimum balance that the account should maintain, and current balance. The program should then output the account number, account type, current balance, and an appropriate message. Test your program by running it five times, using the following data:				

---	---	---	---
46728	S	1000	2700.00
87324	C	1500	7689.00
79873	S	1000	800.00
89832	C	2000	3000.00
98322	C	1000	750.00		**20 marks**

Solution:

```cpp
#include<iostream>
#include<conio.h>
#include<fstream>
#include<string>
#include<iomanip>
using namespace std;
int main ()
{
 ifstream inFile;
 ofstream outFile;

 int i,number, minbalance;
 char tpye;
 double current,update;

 inFile.open ("exam3re.txt");
 if(!inFile)
 {
 cout<<"Cannot Open the input file. The program terminates."<<endl;
 return 1;
 }
 outFile.open ("exam3reout.txt");
 outFile<<fixed<<setprecision(2);
 cout<<"Data Processing:"<<endl;

 for(i=1;i<=5;i++)
 {
 inFile>>number>>tpye;
 inFile>>minbalance>>current;

 switch(tpye)
 {
        case 'S':if(current<minbalance)
                {update=current-10.0;
              outFile<<setw(8)<<number<<setw(4)<<tpye<<setw(10)<<update;
                outFile<<"\tThe service charge is : $10.00."<<endl;}
                else
                {update=current+(current*0.04);
                outFile<<setw(8)<<number<<setw(4)<<tpye<<setw(10)<<update
                        <<"\tThe interest is : "<<(current*0.04)<<endl;}
                 break;

        case 'C':if(current<minbalance)
                {update=current-25.0;
                outFile<<setw(8)<<number<<setw(4)<<tpye<<setw(10)<<update
                        <<"\tThe service charge is : $25.00."<<endl;}
                else if(current<(5000+minbalance))
                {update=current+(current*0.03);
                outFile<<setw(8)<<number<<setw(4)<<tpye<<setw(10)<<update
                <<"\tThe interest is : "<<(current*0.03)<<endl;}
```

	else
	{update=current+(current*0.05);
	outFile<<setw(8)<<number<<setw(4)<<tpye<<setw(10)<<update
	        <<"\tThe interest is : "<<(current*0.05)<<endl;}
	      break;
	 }
	}
	 inFile.close();
	 outFile.close();
	 return 0;
	 }	

4. (a)	Write a temperature-conversion program that gives the user the option of converting Celsius to Fahrenheit. Using the equation *Fahrenheit = (9/5) * Celsius +32*. Your program should then display the temperature in degrees Celsius and equivalent Fahrenheit to complete following table.
	
	            Celsius Fahrenheit
	         45
	         50
	         55
	         60
	         65
	         70
	
	Solution:
	
	``cpp
	#include <iostream>
	#include <iomanip>
	
	using namespace std;
	int main()
	
	{
	    int fahrenheit=0,i;
	    double fah;
	
	    cout<<setw(10)<<"Celsius"<<setw(15)<<"Fahrenheit"<<endl;
	    for(i=45;i<=70;i=i+5)
	        {
	        fah=(9.0/5)*i+32;
	        fahrenheit=static_cast<int>(fah);
	        cout<<setw(8)<<i<<setw(15)<<fah<<endl;
	        }
	
	    return 0;
	}
	``
		15 marks

4. (b)	Write the C++ Program that prompts the user to enter the weight of a person in kilograms and outputs the equivalent weight in pounds. Output both the weights rounded to two decimal places. (1 kilogram=2.2 pounds) Format your output with two decimal places.	**5 marks**

Solution:

```cpp
#include <iostream>
#include <iomanip>

using namespace std;
int main()
{
        double weight,pounds;
        cout<<"Enter the weight of a person in kilogram : ";
        cin>>weight;
        cout<<fixed<<showpoint;
        cout<<setprecision(2);
        pounds= weight*2.2;
        cout<<"The weight of a person in kilogram : "<<weight<<endl;
        cout<<"The equivalent weight of a person in pound : "<<pounds<<endl;
        return 0;

}
```

5. (a)	Coulomb's law states that the force F acting between two electrically charged spheres is given by the formula $F = k\, q_1\, q_2/\, r$, where q_1 is the charge on the first sphere, q_2 is the charge on the second sphere, r is the distance between the centers of the two spheres, and k is a proportionality constant. Write the program to calculate the force F. Format your output with four decimal places. The program should then display the result and ask whether the user wants to continue.	**10 marks**

Solution:

```cpp
#include <iostream>
#include <iomanip>
const double k=9.0E9;
using namespace std;
int main()
{
        double q1,q2,distance,force=0;
        char ch;

        do
        {
        cout<<"Enter the charges of two objects : ";
        cin>>q1>>q2;
        cout<<"Enter the sperartion distance between two objects : ";
        cin>>distance;
        cout<<fixed<<showpoint;
        cout<<setprecision(4);
        force= (k*q1*q2)/(distance*distance);
        cout<<"The magnitude of electrical force : "<<force<<endl;
        cout<<k<<endl;
        cout<<"Do another?(y or n): ";
        cin>>ch;
        }while(ch!='n');

        return 0;
}
```

| 5. (b) | The perimeter, surface area, and volume of an in-ground pool are given by the following formulas:

Perimeter = 2(/ength + width)
*Volume = length * width * average depth*
*Underground surface area = 2(length + width) average depth + length * width*

Using these formulas as a basis, write a C program that accepts the length, width, and average depth measurements, and calculates the perimeter, volume, and underground surface area of the pool.

Solution:

```cpp
#include <iomanip>
#include<iostream>
using namespace std;
int main()
{
        double length,width,avg_depth,perimeter,volume,under_surface_area;

        cout<<"Enter the length in feet: ";
        cin>>length;
        cout<<"Enter the width in feet: ";
        cin>>width;
        cout<<"Enter the average depth measurement in feet: ";
        cin>>avg_depth;

        perimeter = 2*(length+width);
        volume = length * width *avg_depth;
        under_surface_area = (perimeter*avg_depth) + (length*width);

        cout<<"The perimeter is : "<<perimeter<<" feet"<<endl;
        cout<<"The volume is : "<<volume<<" feet cub"<<endl;
cout<<"The underground surface area is : "<<under_surface_area
    <<" feet squar"<<endl;

        return 0;

}
``` | **10 marks** |

$$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$ \text{ End Of Questions } \$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$\$$$