

MANDALAY TECHNOLOGICAL UNIVERSITY
DEPARTMENT OF MECHATRONIC ENGINEERING
First Semester Examination of Second Year

McE 21019 Computer System Architecture and Programming I

Date: 1. 4. 2017.

Time: 9:00 To 12:00 AM

Answer **ALL** Questions.

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. **(5 marks)**

- 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;`

1. (b). What is the output of the following nested for loop statements? **(5 marks)**

```
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;
}
```

1. (c) Rewrite the following expressions using an if...else statement. (Assume that all variables are declared properly.) **(5 marks)**

- i. `(x < 5) ? y = 10 : y = 20;`
- ii. `(fuel >= 10) ? drive = 150 : drive = 30;`
- iii. `(booksBought >= 3) ? discount = 0.15 : 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 $0 < \text{overSpeed} \leq 8$, the value assigned to **fine** is \$20.00; if $8 < \text{overSpeed} \leq 15$, the value assigned to **fine** is \$65.00 if $15 < \text{overSpeed} \leq 25$, the value assigned to **fine** is \$150.00; if $\text{overSpeed} > 25$, the value assigned to **fine** is \$125.00 plus \$25.00 per mile over 25. **(5 marks)**

2. (a) Rewrite the following as a **for loop**. What is the output of this loop? **(10 marks)**

```
int i = 0, value = 0;
while (i <= 10)
{
    if (i % 2 == 0 && i <= 7)
        value = value + i * i;
    else if (i % 2 == 0 && i > 7)
        value = value + i;
    else
        value = value + i * i;
    i++;
}
```

```

    value = value - i;
    i = i + 1;
}
cout << "value = " << value << endl;

```

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. **(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:
- Savings accounts receive 4% interest.
 - Checking accounts with balances of up to \$5,000 more than the minimum balance receive 3% interest; otherwise, the interest is 5%. **(20 marks)**

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

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. **(15 marks)**

Celsius	Fahrenheit
45	
50	
55	
60	
65	
70	

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)**

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)
5. (b) The perimeter, surface area, and volume of an in-ground pool are given by the following formulas:
 $Perimeter = 2(length + width)$
 $Volume = length * width * average\ depth$
 $Underground\ surface\ area = 2(length + width) * average\ depth + length * width$
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.

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