


## National University of Computer and Emerging Sciences, Lahore Campus

|   |              |                             |              |           |
|---|--------------|-----------------------------|--------------|-----------|
|  | Course Name: | Programming Fundamentals    | Course Code: | CS1002    |
|   | Program:     | Electrical Engineering      | Semester:    | Fall 2023 |
|   | Duration:    | 1 Hour                      | Total Marks: | 30        |
|   | Exam Date:   | 28 Sept 2023                | Weight:      | 15        |
|   | Section:     | All                         | Page(s):     | 5         |
|   | Exam Type:   | Sessional - 1 Exam Solution | CLO #        | 1, 2      |

Student Name: \_\_\_\_\_ Roll No. \_\_\_\_\_ Section: \_\_\_\_\_

**Instruction/Notes:**

1. Do not forget to write your Name and Roll Numbers.
2. Solve on the paper and Return. **Answer sheets are not required.**

### Question No. 1 (CLO No. 2)

**Marks: 10**

A heat exchanger (radiator in your car), dissipates heat over a certain period of time according to following formulae.

$$(mfr) \times (h1) = (mfr) \times (h2) + qfr$$

Where

mfr (mass flow rate) =  $m$  (total mass of cooling water passed through radiator) /  $t$  (time interval)

qfr (heat flow rate) =  $q$  (total heat dissipated by radiator) /  $t$  (time interval)

$h1$  = enthalpy (a thermodynamic property of water) at the entrance of radiator

$h2$  = enthalpy (a thermodynamic property of water) at the exit of radiator

(For simplicity we are neglecting units of the quantities and treating each quantity as a floating point number)

**Generate** an algorithm in the form of a C++ program and pseudo code to perform following actions. Get  $m$ (total mass),  $t$ (time interval),  $h1$  and  $h2$  from the user. The program calculates  $qfr$  (heat flow rate) of the system. The program prints, total heat, heat flow rate and a message according to the logic given in next sentence. If heat flow rate is equal or larger than 500 program prints the message that engine is hot. If heat flow rate is larger than 100 but less than 500, program prints the message that engine has appropriate temperature. If heat flow rate is less than 100 program prints the message that engine is cold.

A sample run of the program should look like below:

Enter  $m$ ,  $t$ ,  $h1$  and  $h2$  respectively (the user enters 18, 12, 800,300)

Heat flow rate = 750

Total heat dissipated = 9000

Engine is hot

### **Pseudo-code**

1. Declare variables for mass (m), time (t), enthalpy 1 (h1), enthalpy2 (h2), heat flow rate (qfr), and total heat dissipated (q)
2. Input from the user the following: m, t, h1, and h2
3. Calculate qfr using the formula

$$qfr = ((m/t) \times h1) - ((m/t) \times h2)$$

4. Calculate q using the formula

$$q = qfr \times t$$

5. Display qfr and q on the screen
6. If qfr is less than 100 display Engine is cold  
If qfr is more than 100 and less than 500 display Engine has appropriate temperature  
If qfr is more than 500 display Engine is hot

**Write down C++ program on next page**

### C++ Program

```
#include <iostream>

using namespace std;

int main ()
{
    float m, t, h1, h2, qfr, q;

    cout<<"Enter m, t, h1 and h2 respectively";

    cin>>m>>t>>h1>>h2;

    qfr = ((m/t) x h1) – ((m/t) x h2);

    q = qfr * t;

    cout<<"Heat flow rate ="<<qfr<<endl;

    cout<<"Total heat dissipated ="<<q<<endl;

    if (qfr < 100)

        cout<<"Engine is cold";

    else if (qfr>100 && qfr<500)

        cout<<"Engine has appropriate temperature";

    else

        cout<<"Engine is hot";

    return 0;

}
```

**Question No. 2 (CLO No.1)****Marks: 10**

**Implement** a C++ program that accepts days as integer and displays total number of years, months and days in it. A year has 365 days and a month has 30 days.

For example: If user input is 856 days the output should be 2 years 4 months 6 days.

```
#include <iostream>

using namespace std;

int main ()
{
    int totalDays, years, months, days;

    cout<<"Enter total number of days:";

    cin>>totalDays;

    years = totalDays/365;

    months = (totalDays%365)/30;

    days = (totalDays%365)%30;

    cout<<years<<"years"<<months<<"months"<<days<<"days";

    return 0;
}
```

**Generate** the output of the following code segments. Show working.

```
int a1 = 5, b1 = 7, c1 = 13, d1 = 14;
cout<<(d1*c1 + d1%a1- 3*a1)/(c1%a1-2) <<endl;
```

**Solution:**

$$(14*13 + 14\%5 - 3*5) / (13\%5 - 2)$$
$$(182 + 4 - 15) / (3 - 2)$$
$$171/1$$
$$171$$

```
int a1 = 5, b1 = 7, c1 = 13, d1 = 14;
int found = 0;
cout<< "The expression evaluates to:" << (found || (b1*b1-d1/a1-1>35))&&((16-2*a1)<=6);
```

**Solution:**

$$0 \parallel (7*7 - 14/5 - 1 > 35) \&\& (16 - 2*5) <= 6)$$
$$0 \parallel (49 - 2 - 1 > 35) \&\& (16 - 10) <= 6)$$
$$0 \parallel (46 > 35) \&\& (6 <= 6)$$
$$\text{false} \parallel \text{true} \&\& \text{true}$$
$$\text{false} \parallel \text{true}$$
$$\text{true}$$