



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2022/2023**

COURSE NAME	:	OBJECT-ORIENTED PROGRAMMING
COURSE CODE	:	BIT 20603
PROGRAMME CODE	:	BIT
EXAMINATION DATE	:	FEBRUARY 2023
DURATION	:	3 HOURS
INSTRUCTION	:	<ol style="list-style-type: none">1. ANSWER ALL QUESTIONS.2. THIS FINAL EXAMINATION IS CONDUCTED VIA CLOSED BOOK.3. STUDENTS ARE PROHIBITED TO CONSULT THEIR OWN MATERIAL OR ANY EXTERNAL RESOURCES DURING THE EXAMINATION CONDUCTED VIA CLOSED BOOK.

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THIS QUESTION PAPER CONSISTS OF SEVEN (7) PAGES

Q1 Answer question Q1(a) – Q1(g) based on the program codes in Figure Q1.

```
class Data1{
    private int a = 1;
    private double c = 2.456;

    double getData() {
        return c;
    }
}

class Data2{
    private int b, c;
    public String color = "Red";

    Data2(int f, int g){
        this.b=f;
        this.c=g;
    }

    String getColor() {
        return color;
    }

    int sum () {
        return b + c;
    }
}

public class Main {
    public static void main(String[] args) {
        Data1 obj1 = new Data1();
        Data2[] obj2 = new Data2[3];

        // statements (a) - (g) to be implemented here

    }
}
```

Figure Q1

Determine whether each of the following statement is **VALID** or **INVALID** to be implemented in the main method.

- (a) `System.out.println(obj1.a);` (2 marks)
- (b) `System.out.println(obj1.getData());` (2 marks)
- (c) `System.out.println(obj2.getColor());` (2 marks)
- (d) `obj2[0] = new Data2(1,2);`
`System.out.println(obj2[0].sum());` (2 marks)

- (e) `obj[1].color = "Blue";` (2 marks)
- (f) `double d = 10 * obj1.getData();`
`System.out.println(d);` (2 marks)
- (g) `obj2[2] = new Data2(4,6.5);`
`double e = 2 + obj2[2].sum();` (2 marks)

Q2 Answer question Q2(a) – Q2(c) based on the information given in **Figure Q2**.

A class named Rectangle contains:

- Two double data fields named width and height that specify the width and height of the rectangle.
- A no-argument constructor that creates a rectangle with default value 1 for both width and height.
- A constructor that creates a rectangle with the specified width and height.
- A method named getArea() that returns the area of rectangle.
- A method named getPerimeter() that returns the perimeter of rectangle.
- A toString method that returns a string contains height, width, area of rectangle, and perimeter of rectangle.

Figure Q2

- (a) Draw the UML diagram for the class. (9 marks)
- (b) Write a Java program to create class Rectangle. Implement all its attributes and methods. (21 marks)
- (c) Write a Java program to create class MainRectangle. Implement method main in this class. Instantiate two Rectangle objects, one with default values and the other with width 4 and height 40. Display the width, height, area, and perimeter of each rectangle using toString() method. (6 marks)

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Q3 Answer question **Q3(a)** – **Q3(h)** based on the information given in **Figure Q3**.

A building surveyor has assigned you to write an application that calculates the total labour cost of building a cylinder water tank for an office building. To calculate the labour cost, you multiply the volume of the tank ($\pi \times \text{radius}^2 \times \text{height}$) by the price per cubic metre of tank.

For example, the volume of tank with 10 metres radius and 15 metres height is 4,710 cubic metres. To build the tank with labour cost of RM20 per cubic metre would result in total labour cost of RM94,200.00 ($20.00 \times 4,710$).

First, you should create a class named CylinderTank that has two fields: one for the radius of the tank and one for the height of the tank. The CylinderTank class should have a method that returns the volume of the tank.

Next, you should create a WaterTank class that has a CylinderTank object as a field. It should also have a field for the cost of the labour per cubic metre. The WaterTank class should have a method called findTotalLabourCost() that returns the total labour cost for building the tank. The following diagram shows possible class design and depicts the relationship between the WaterTank and CylinderTank classes.

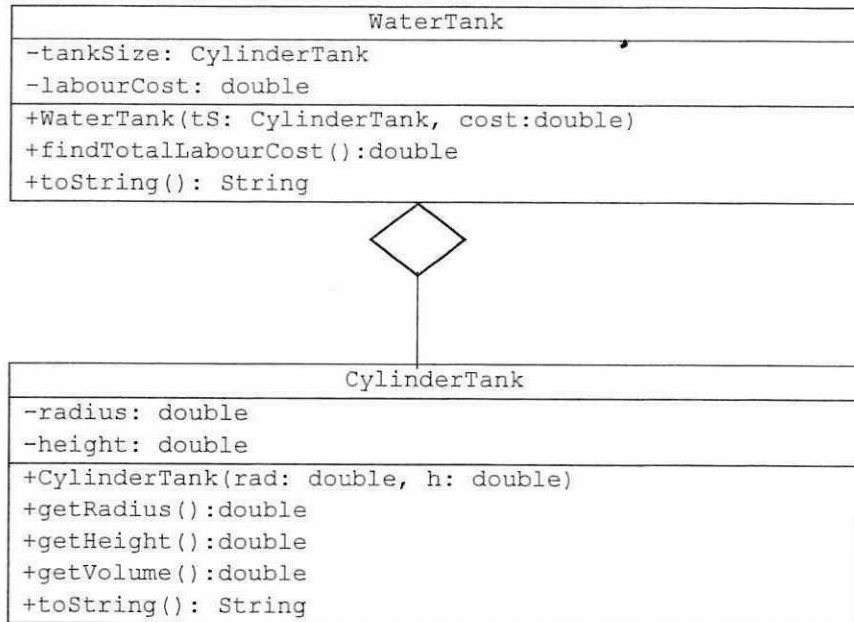


Figure Q3

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- (a) Declare data field(s) for `CylinderTank`. (2 marks)
- (b) Write a constructor with argument(s) for `CylinderTank`. (4 marks)
- (c) Write `getRadius()` method. (3 marks)
- (d) Write `getHeight()` method. (3 marks)
- (e) Write `getVolume()` method. Assume that the value of π is equal to 3.14. (5 marks)
- (f) Declare data field(s) for `WaterTank`. (2 marks)
- (g) Write a constructor with argument(s) for `WaterTank`. (6 marks)
- (h) Write `findTotalLabourCost()` method. (7 marks)

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Q4 Answer question Q4(a) – Q4(d) based on the information given in Figure Q4.

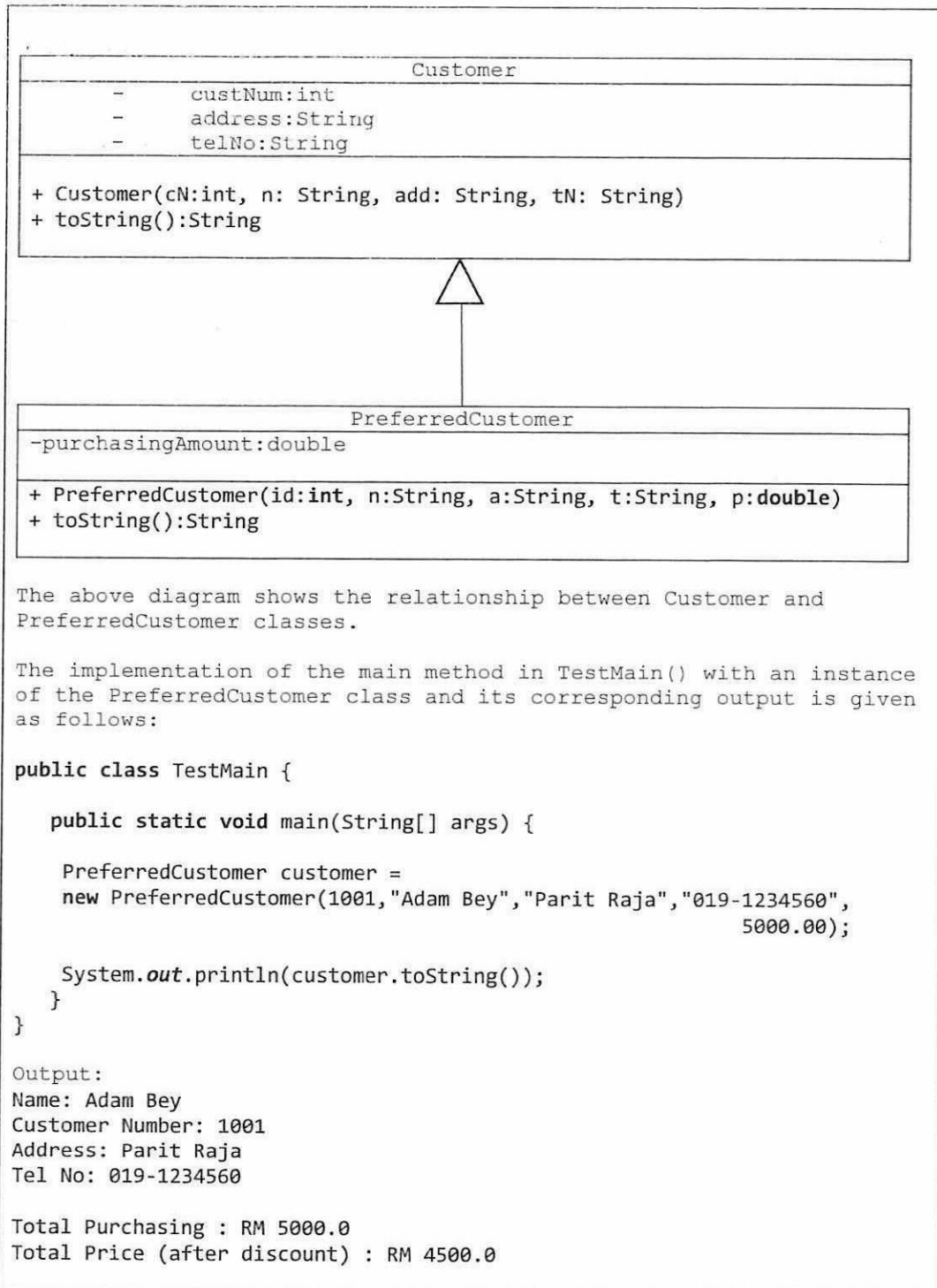


Figure Q4

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- (a) Write class header for `PreferredCustomer`. (2 marks)
- (b) Declare data field(s) for `PreferredCustomer`. (1 mark)
- (c) Write a constructor with argument(s) for `PreferredCustomer`. The constructor must be suitable to be used by the instance declared in the `TestMain()` class. (3 marks)
- (d) Write `calcDiscountPrice()` method to return the price after discount is given based on purchasing amount. The percentage of the discount is given in **Table Q4(d)**.

Table Q4(d): Percentage of discount based on purchasing amount

Purchasing Amount	Discount (%)
Less than 500	0
500 and above, but less than 1000	5
1000 and above, but less than 1500	6
1500 and above, but less than 2000	7
2000 and above	

(12 marks)

-END OF QUESTIONS-

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