PART A – OBJECTIVE QUESTIONS [20 marks]

Part A consists of 20 objective questions. Choose the best answer, and write your answer in the answer sheet provided in **page 2** Each question carries 1 mark.

1. What will be the output of the following source codes?

```
1  ArrayList <String> colorList = new ArrayList <String>();
2  colorList.add("Purple");
3  colorList.add("Blue");
4  colorList.add("White");
5  System.out.println("Index Color Blue: " +
6  colorList.indexOf ("Blue");
```

   A. 1
   B. 2
   C. 3
   D. 4

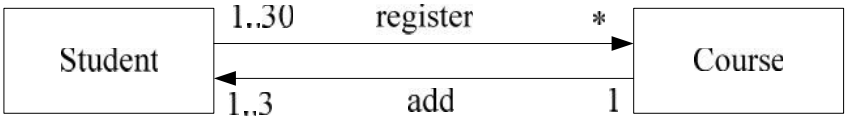
2. Which of the following method is used to determine the number of items stored in an `ArrayList` object?
   A. `size`
   B. `capasity`
   C. `item`
   D. `length`

3. Which of the following method will deletes an item from an `ArrayList` object?
   A. `erase`
   B. `purge`
   C. `remove`
   D. `delete`

4. _____ is usually represented as data field in another class.

   A. Inheritance
   B. Aggregation
   C. Concatenation
   D. Polymorphism

5. Which of the following statements are **TRUE** based on the diagram below?



   i. An object of **`Student`** class can be the parameter in **`add`** method.
   ii. An object of **`Course`** class can be the parameter in **`register`** method.
   iii. Class **`Course`** can instantiate more than one instance of **`Student`** class.
   iv. Class **`Student`** can instantiate only one instance of **`Course`** class.

   A. i and iv
   B. ii and iv
   C. i, ii and iii
   D. i, ii and iv

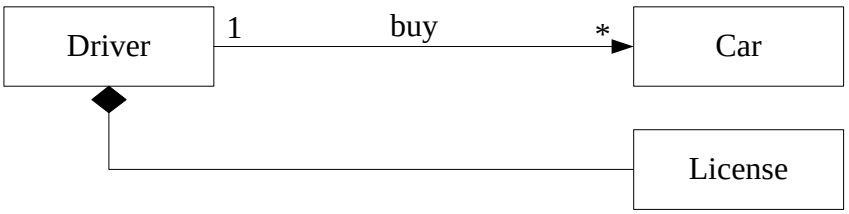
6. Which of the following statements is **NOT TRUE** about the association relationship between classes?

   A. No arrow in an association UML class diagram shows unidirectional association.
   B. Association between two classes can be represented as a data field in one of the class.
   C. In association, the activity between classes can be represented as a method in one of the class.
   D. In association, the object one of the class can be the parameter in the method that represents a relationship between classes.

7. Which of the following statement is **TRUE**?

A. An aggregation represents '*has-a*' relationship.
B. An aggregation represents strong binding relationship.
C. A composition is represented in UML using an empty diamond symbol
D. An aggregation is represented in UML using solid diamond symbol

8. Which of the following relationships are represented by the class diagram below?



i. Association.
ii. Aggregation.
iii. Composition.
iv. Inheritance.

A. i and ii
B. i and iii
C. i and iv
D. ii and iv

9. The following statements describe hierarchy structure of classes:

```
Banana is a Fruit
Durian is a Fruit
PisangAmbon is a Banana
PisangTanduk is a Banana
```

Which one is the **ILLEGAL** statement?

A. `Fruit a = new Banana();`
B. `Fruit b = new Durian();`
C. `Banana c = new PisangAmbon();`
D. `PisangAmbon d = new Fruit();`

10. Which of the following statements is **FALSE**?

A. A public class can be accessed by a class from a different package.

B. A private method cannot be accessed by a class in a different package.

C. A protected method can be accessed by a subclass in a different package.

D. A method with no visibility modifier can be accessed by a class in a different package.

11. What is the output of the following code?

```
1   public class Test1 {
2     public static void main(String[] args) {
3       Child c = new Child();
4       c.print();
5     }
6   }
7
8   class Parent {
9     int id = 1;
10    void print() {
11      System.out.println(id);
12    }
13  }
14
15  class Child extends Parent {
16    int id = 2;
17  }
```

A. `0`

B. `1`

C. `2`

D. `Nothing`

12. Which one is the **INCORRECT** statement about Java inheritance?

A. Private fields and methods are not inheritable in Java.

B. Private fields can be accessed from subclasses by using superclass public methods.

C. Java does not support multiple inheritances.

D. Methods that are marked as `final` must return a constant.

13. What is the output of running class C?

```
1   class A {
2     public A() {
3       System.out.println("Good Luck");
4     }
5   }
6
7   class B extends A {
8     public B() {
9       System.out.println("Don't worry be happy");
10    }
11  }
12
13  public class C  {
14    public static void main(String[] args) {
15      B b = new B();
16    }
17  }
```

A. `Good Luck`

B. `Don't worry be happy`

C. `Good Luck`
`Don't worry be happy`

D. `Don't worry be happy`
`Good Luck`

14. Given the following Java program:

```
1   class A {
2     public void method () {
3       System.out.println ("Class A");
4     }
5     public void method (String a) {
6       System.out.println (a);
7     }
8   }
9
10  class B extends A {
11    public void method (String a) {
12      System.out.println ("Class B");
13      super.method(a);
14    }
```

```
15  }
16
17  class C extends B {
18    public void method () {
19      System.out.println ("Class C");
20    }
21  }
22
23  public class TestClass {
24    public static void main (String[] args) {
25      A item1 = new B();
26      item1.method("Hello, world!");
27    }
28  }
```

What will be printed on screen if this program is executed?

A. `Hello, world!`

B. `class B`
`Hello, world!`

C. `class B`

D. `class BHello, world!`

15. A class which implements an `interface` must follow several rules. Which of following is **INCORRECT** regarding these rules?

A. The class must implement all `interface` methods.

B. In class the implementation must not be concrete which means both non-abstract and abstract classes are allowed.

C. The class must follow all the rules for legal override.

D. The class must maintain the signature of `interface` methods.

16. Regarding `interface` and `abstract` classes, which of the following is **CORRECT**?

A. A normal class can only inherit one `interface` class.

B. An `abstract` class which inherits from an `interface` class, must implement all the methods of the `interface` class.

C. An `abstract` class can have `private` methods while in an `interface` class all the methods must be `public`.

D. Both `abstract` and `interface` classes are able to have constructors inside them.

17. Considering the following program which statement is **TRUE**?

```
1    public interface test1 {
2        double PI = 3.1415;
3        double calculateArea(double radius);
4    }
```

A. The definition of `PI` is incorrect because it must be defined as `public static final double PI = 3.1415;`

B. The definition of `calculateArea()` is incorrect because it must be defined as `abstract final double calculateArea(double radius);`

C. The definition of `calculateArea()` is incorrect because it must be defined as `public abstract double calculateArea(double radius);`

D. There is no error in the program and all of the definitions are correct.

18. What happens when the following program executed?

```
1  public class MyFinal {
2    public static void main(String[] args)
3    {
4     try
5     { return; }
6     finally
7     { System.out.println("Great, Finally !"); }
8    }
9  }
```

A. It prints `Great, Finally !`

B. It runs without output.

C. Compilation fails.

D. An exception is thrown at runtime.

19. Which "`Message`" will not be displayed when the following code executed?

```
1   public class MyFinal_2 {
2    public static void main(String[] args)
3    {
4     try
5     { errMethod();
6       System.out.println("Message 1"); }
7     catch (Exception ex)
8     { System.out.println("Message 2"); }
9     finally
10    { System.out.println("Message 3"); }
11    System.out.println("Message 4");
12   }
13   public static void errMethod() {}
14  }
```

A. `Message 1`
B. `Message 2`
C. `Message 3`
D. `Message 4`

20. What happens after the following code executed?

```
1   try
2   {  int x = 0;
3      int y = 11/x; }
4   catch (Exception ex)
5   {  System.out.println("Exception A");  }
6   catch (ArithmeticException ae)
7   {  System.out.println("Arithmetic Exception");  }
8   System.out.println("Finished");
```

A. Message `Exception A` will be displayed.
B. Message `Arithmetic Exception` will be displayed.
C. Message `Finished` will be displayed.
D. Compilation fails.

PART B - STRUCTURED QUESTIONS **[60 marks]**

Part B consists of 5 structured questions. Answer all questions in the space provided. The marks for each part of the question is as indicated.

Question 1 **[10 marks]**

Answer the following questions that refer to **`ArrayList`** class, named **`name`** to hold a list of students' name.

```
1   ArrayList name = new ArrayList();
2   name.add("Ani");
3   name.add("Budi");
4   name.set(0,"Abu");
5   name.add(1,"Ali");
6   name.add(1,"Ava");
7   System.out.println(name);
8
9   name.add(2,"Diva");
10  name.set(3,"Cantika");
11  name.add(1,"Alya");
12
13  System.out.println(name);
14  System.out.println("Size of arraylist: " + name.size());
```

a) Draw the current memory overview (the content) of **`name`**:

i) Based on the source code given in line 2 to line 6. [2 marks]

Answer:

ii) Based on the source code given in line 9 to line 11. [3 marks]

Answer:

b) What is the output of the above program? [3 marks]

Answer:

c) Write a statement(s) to determine whether `Aza` is in the list and print appropriate message. [2 marks]

Answer:

Question 2 **[10 marks]**

Given the following Java program, answer questions (a) to (d).

```
1   class Author {
2    private String name;
3    private Book[] myBook = new Book[10];
4    private int numOfBook;
5
6    public Author(String name){
7     this.name = name;}
8
9    public void write(Book bk){
10      ______myBook[numOfBook]=bk;_____________________
11      ______numOfBook++;_____________________________ }
12
13   public void print(){
14    System.out.println("AUTHOR NAME: " + name);
15    System.out.println("NUMBER OF BOOK(s) WRITTEN: " +
16     numOfBook);
17    for(int i=0; i < numOfBook; i++) {
18       ___Book s = myBook[i];_____________________
19       System.out.print((i+1) + ") " + s.getName());
20       System.out.printf("\tRM%.2f", s.getPrice());
21       System.out.println(); }}}
```

```
22  class Book {
23   private String name;
24   private double price;
25
26   public Book (String name, double price){
27    this.name = name;
28    this.price = price;}
29
30   public String getName(){
31    return name; }
32
33   public double getPrice(){
34    return price; }}
35
36  public class BookTest {
37   public static void main (String [] args) {
38     Author author=new Author("Rosli Awang");
39     Book newBook=new Book("Saat Berjaya",45.70);
40       author.write(newBook);
41       author.print();                          }}
```

a) Based on the program above, draw the UML class diagram that shows the relationship among classes. [3 marks]

Answer:

Composition

b) Write codes for **`write()`** method (at line 10 to 11), to add objects from the **`Book`** class to a **`myBook`** array. The objects added to the array refer to the books written by an author. [2 marks]

Answer:

c) Write a suitable statement at line 18 to complete the codes for **`print()`** method. [1 mark]

Answer:

d) Write codes for **`main()`** method in **`BookTest`** class (at line 38 to 41) to create the object(s) of the **`Author`** and **`Book`** class. The codes should also be able to produce the output as shown in Figure 1. [4 marks]

```
AUTHOR NAME: Rosli Awang
NUMBER OF BOOK(s) WRITTEN: 1
1) Saat Berjaya RM45.70
Press any key to continue . . .
```

Figure 1

Answer:

Question 3 **[10 marks]**

Consider the following incomplete Java program. Answer questions (a) to (c).

```
1   class Person {
2      public int age;
3
4      public Person(int a) {
5       age = a;
6      }
7
8      public void printinfo() {
9       System.out.println("person: age = "+ age);
10     }
11  }
12
13  class Student extends Person {
14      public int id;
15
16  // a. create constructor class Student that inherits
17  // attribute of superclass Person
18  public Student(int age, int id) {
19         super(age);
20         this.id=id;
21  }
22     public void printinfo() {
23       System.out.println("student: age = "+ age +
24       " id = " + id);
25     }
26  }
27  class Grad extends Student {
28     public double salary;
29
30    // b. create constructor class Grad that inherits
31    //attribute of superclass Student
32    public Grad(int age, int id,
33    double salary) {
34          super(age,id);
35           this.salary=salary;
36    }
37
38    public void printinfo() {
39     System.out.println("graduate student: age = "+ age + "
40     id = " +         id + " salary = " + salary);
```

```
41    }
42  }
43
44  public class PersonTester2   {
45    public static void main(String[] args){
46      Object x[] = new Object[3];
47      int studentId = 1234;
48      int studentAge= 19;
49      int personAge = 44;
50      int gradId = 905854;
51      int gradAge = 28;
52      double gradSalary = 1770.00;
53      x[0] = new Student(studentAge, studentId);
55      x[1] = new Person(personAge);
56      x[2] = new Grad(gradAge, gradId, gradSalary);
57      for (int i=0; i < x.length; i++) {
58        Person p = (Person)x[i];
59        p.printinfo();
60      }
61  }}
```

a) Complete the definitions of constructors of class `Student` in the spaces provided in the program. [3 marks]

b) Complete the definitions of constructors of class `Grad` in the spaces provided in the program. [3 marks]

c) If the constructors of the program are properly completed, what will be the output of this program. [4 marks]

Answer:

person: age = 19
person: age = 44
person: age = 28

Question 4 **[6 marks]**

There is an interface `Packable` presents in Figure 2. Figure 2 also has an object called `Item`. Assume `Item` is a pre-defined class.

```
public interface Packable {
   public boolean addItem(Item x);
   public Item removeItem(Item x); }
```

Figure 2

The following class in the Figure 3 is supposed to be a subclass of a pre-defined class `Bag`, and implement the `Packable` interface. The **...** at line 14 is not an error, it just indicates some irrelevant code goes there that is not shown.

```
1   public class Backpack inherits Bag implements Packable
2   {
3     int maxItems;
4     int num;
5
6     public Backpack(int capacity) {
7       this.maxItems = capacity;
8       this.num = 0; }
9
10    public boolean addItem(Item x, int index) {
11      if (this.num < this.capacity)
12      {
13        //Add the item somehow
14        ...
15        this.num++;
16        return true;
17      }
18      return false; }
19  }
```

Figure 3

There are four (4) errors in the class `Backpack` as shown in the Figure 3 when implementing the `interface` class. Identify them and propose suitable code to correct the errors. State your answers in the Table 1 below.

Table 1

No of Line	Error Code	Corrected Code

Question 5 **[14 marks]**

a) The program below contains four (4) errors. Write the line code that contains the error and give the correct one. State your answer in Table 2 below. [6 marks]

```
1   // File Name : MyTest.java
2   import java.io.*;
3   public class MyTest {
4     public static void main(String args[]) {
5       double myDouble[] = new double[5];
6
7       Try {
8         System.out.println("Access element sixth :" +
9         myDouble[6]); }
10      Catch (ArrayIndexOutOfBounds) {
11        System.out.println("Exception thrown  :" + eE); }
12
13      System.out.println("Out of the block"); }
14  }
```

Table 2

No of Line	Error Code	Corrected Code

b) What will be the output of the above program after the error in (a) has been corrected. [2 marks]

Answer:

c) What will be the output of the above program if `myDouble[6]` is changed to `myDouble[0]`, where line 8 will be: `System.out.println("Access element 0 :" + myDouble[0]);` [2 marks]

Answer:

d) Rewrite the above program using a `finally` block. Add the statements below for the block. [4 marks]

```
a[0] = 6;
System.out.print("First element value: " + a[0]);
System.out.println("The finally statement is executed");
```

Answer:

PART C – PROGRAMMING QUESTION **(Done!)** **[30 marks]**

Part C consists of 1 question only. Answer the question in the space provided.

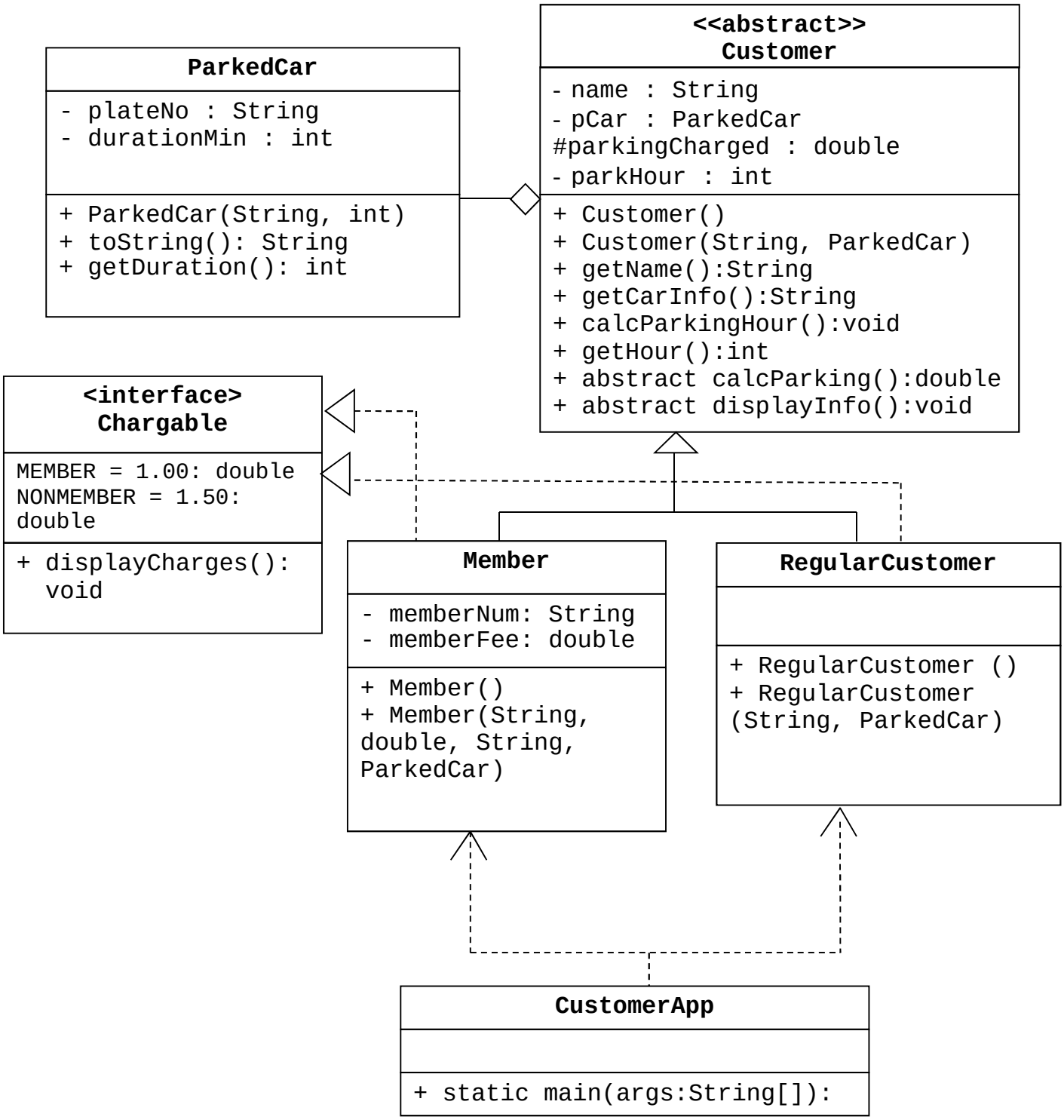


Figure 4

```
public class CustomerApp {
 public static void main(String[] args) {
     ParkedCar p1 = new ParkedCar("WWW999", "85");
     ParkedCar p2 = new ParkedCar("JQA101", "85");
     Customer c1 = new Member(“MM111”, 12.00, "Mr. Lim", p1);
     Customer c2 = new RegularCustomer("Sarah Ali", p2);
     c1.displayInfo();
     c2.displayInfo(); }}
```

Figure 5

```
Welcome Mr. Lim,  You are a member
Your Member Fee : RM12.00
You will get free parking for the first two hours,
Your Car Detail : WWW999
Your Parking duration : 2 hours
Your Parking Payment : Rm 0.00

Welcome Sarah Ali,  You are not a member
You will be charged RM 50.00 for parking more than 20 hours
Your Car Detail : JQA101
Your Parking duration : 2 hours
Your Parking Payment : Rm 3.00
```

Figure 6

Answer the following questions:

1. Given the class diagram shown in Figure 4, write the `class` definitions and `interface` definition for all classes and interface in Figure 4.
2. Write the `abstract` method to fulfill the following requirements.
   a) Based on the **`CustomerApp`** class in Figure 5, write the codes for `displayInfo()` method that will call `displayCharges()` and `getCarInfo()` to display the output as in Figure 6.
   b) Write the codes for `calcParking()` method that will call `calcParkingHour()` method to convert the total parking hour durations from minutes to hours. Calculate the parking charges for each customer based on the criteria as follows:

Member	No charge for the first 2 hours, and RM1.00 for every other parking hour. Example : 85 minutes ; 2 hours, Parking Charged is RM0.00 340 minutes; 6 hours, Parking Charged is RM4.00
Regular Customer	RM1.50 for every hour parked and RM50.00 if the car has been parked for 20 hours or more. Example : 85 minutes; 2 hours, Parking Charged is RM3.00 340 minutes, 6 hours, Parking Charged is RM9.00