



UNIVERSITI
TEKNOLOGI
PETRONAS

FINAL EXAMINATION MAY 2024 SEMESTER

COURSE : TEB1043/TFB1033 - OBJECT ORIENTED
PROGRAMMING

DATE : 12 AUGUST 2024 (MONDAY)

TIME : 9:00 AM - 12:00 NOON (3 HOURS)

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in the Answer Booklet.
2. Begin **EACH** answer on a new page in the Answer Booklet.
3. Indicate clearly answers that are cancelled, if any.
4. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.
5. **DO NOT** open this Question Booklet until instructed.

Note :

- i. There are **SIX (6)** pages in this Question Booklet including the cover page
- ii. **DOUBLE-SIDED** Question Booklet.

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1. Consider the application code in **FIGURE Q1**:

```
Transactions transactionJune2024 = new Transactions();

Transaction transac00 = new Transaction();
transac00.setDate(new Date());
transac00.setVal(500);
Transaction transac01 = new Transaction(new Date(2000, 11, 21), 259);

transactionJune2024.add(transac00);
transactionJune2024.add(transac01);

System.out.println("June sum = " + transactionJune2024.sum());
```

FIGURE Q1: Application Code

A `Transaction` represents a single business transaction. It comprises a transaction value and a date. A `Transactions` contains a list of transactions.

- a. Draw the UML class diagram for
- `Transaction` class. [4 marks]
 - `Transactions` class. [10 marks]
- b. Write the method `add` for the `Transactions` class. [6 marks]

2. Consider the application code in **FIGURE Q2**. It shows a snippet of a game application code.

```

Board game = new Board();

Ball b = new Ball(BallType.GAMEBALL);
game.add(b);
System.out.println("Num of game balls = " + Ball.getNumGameBall());

Ball b2 = new Ball(BallType.GAMEBALL);
game.add(b2);
System.out.println("Num of game balls = " + Ball.getNumGameBall());

b.move(1,1);
b2.move(2.5f, 3);
System.out.println("b new pos is (" + b.getPos().getX() + ","
                    + b.getPos().getY()+")" );

game.save("game.dat");

```

FIGURE Q2: Game Application Code

A `Ball` represents the main game object, the position of which is determined by the player's actions and the game physics. A `Board` contains a number of `Ball` instances. The state of a `Board` can be saved to a file.

- a. Draw the UML class diagram for
- i. `Ball` class. [4 marks]
 - ii. `Board` class. [10 marks]
- b. Write the method `save` for the `Board` class. [6 marks]

3. A colleague, Sarah, is developing a Word Processing application using a certain Java package, WP. The application code she has completed is shown in **FIGURE Q3**:

```
Document doc = new Document("Book.txt");
Paragraph p0 = new Paragraph(doc);
while (true) {
    String line0 = p0.readLine();
    if (line.length == 0)
        break;
    p0.add(line0);
}
doc.add(p0);
```

FIGURE Q3: Application Code

Document and Paragraph are from the WP package. A Paragraph represents a single paragraph of text and a Document contains a number of paragraphs. The readLine method reads a single line of text from the user.

- a. Draw the UML class diagram for Document and Paragraph. Make clear the relationship between the classes.
- [8 marks]
- b. Sarah noted that the compiler complained of "Unreported IO exception" when she tried to compile the application code in **FIGURE Q3**. Rewrite the code to correct it.
- [2 marks]
- c. Sarah further noted that the WP package does not facilitate multiple people to have access to the documents. Propose, in the form of a UML class diagram, extensions to associate each document with a list of collaborators, where each collaborator is identified by a name and an email address.

[10 marks]

4. Consider the following requirement scenario: A `Store` instance, representing an online retail business, has a certain name and registration ID. Any `Store` object has a `register` and a `close` method; the exact implementation of `register` and `close` depends on whether the `Store` is a single owner business (`SingleOwnerBusiness`) or a company (`SdnBhdBusiness`). A `SingleOwnerBusiness` has an owner identified by a name and an ID, while a `SdnBhdBusiness` has a list of shareholders, each identified by a name and an ID. Further, a `SdnBhdStartup` is a special type of `SdnBhdBusiness`, representing a store owned by a startup company. A startup has a tax exemption registration number.
- a. Draw a UML class diagram that shows the relationship among the classes.
[14 marks]
- b. Based on the relationship in **part (a)**, write an application code that demonstrates polymorphism.
[6 marks]

5. **FIGURE Q5** shows a screenshot of a registration form for a social program.

Online Registration Form

Name

First Last

Email

Phone

#####

Message

SEND

FIGURE Q5: GUI for Registration Form

- a. Write JavaFX code to replicate (approximately) the Graphical User Interface (GUI) shown in **FIGURE Q5**. The `SEND` button does not need to be responsive. [10 marks]
- b. Propose a UML class diagram for the backend. [10 marks]

- END OF PAPER -