



UNIVERSITI
TEKNOLOGI
PETRONAS

**FINAL EXAMINATION
MAY 2024 SEMESTER**

COURSE : TDB2163/TFB1103 - SOFTWARE ENGINEERING
DATE : 5 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 **SEVEN (7)** pages in this Question Booklet including the cover page
- ii. **DOUBLE-SIDED** Question Booklet.

1. a. In order to develop a software architectural organization for an application, a software engineer needs to answer a few design decisions depending on the non-functional system requirement. Identify the non-functional requirement for each architectural organization stated below.
 - i. Use fine-grain, replaceable components
[2 marks]
 - ii. Include redundant components and mechanisms for fault tolerance
[2 marks]
 - iii. Localise critical operations and minimize communications.
[2 marks]
 - iv. Use a layered architecture with critical assets in the inner layers.
[2 marks]
- b. Automated teller machine system (ATM) is a system that acts as distributed kiosks where bank customers can use to deposit and withdraw cash from their accounts.
 - i. Suggest a suitable architecture style for ATM system
[NOTE: Your answer must be supported by **ONE {1}** reason]
[4 marks]
 - ii. Based on your choice of architecture style, draw the architecture diagram for the system with suitable sub-systems.
[8 marks]

2. a. In UML there are two types of models
- i. Describe the **TWO (2)** types of models.
[2 marks]
 - ii. Give **TWO (2)** examples of UML diagrams for each model.
[4 marks]
- b. A company called *OnlineWay* wants to sell products online. The company hires you as a Software Engineer to design their online e-commerce system using object oriented design.
- i. Based on the scenario described, draw class diagrams for each of the following scenarios with **ONE (1)** attribute and **ONE (1)** method for each class and identify relationships among classes either as: Association, Generalization or Aggregation.
 - Products are sold by the Sales Staff to Customer.
[3 marks]
 - Products are Computer Products, Household Products, Electrical Products.
[3 marks]
 - Purchase Order is a whole, bill and payment are its parts.
[3 marks]
 - ii. Create a state-transition diagram for "*OrderProcessing*" object with states of initial state, First Order, Order Processes and Order Canceled.
[5 marks]

3. a. Give **FOUR (4)** steps to define Basis Path Testing. [8 marks]
- b. Describe an independent path. [4 marks]
- c. Discuss the importance of independent paths in Basis Path Testing. [4 marks]
- d. State **TWO (2)** formulas to calculate Cyclomatic Complexity. [4 marks]

4. My Service Station System is a software that will be built and will have four types of services to its customers: Fuel Services, Maintenance Services, Controlling Inventory and Maintain Purchase. The system stores large volumes of information for a long time. The system also needs the data to be managed consistently and stored in central repository.

- a. As a software engineer, you want to develop the software using object oriented design. Convince the service station owner on the advantages of using object oriented design by giving elaborations on **TWO (2)** object oriented design principles that will benefit the system design.

[5 marks]

- b. In order to develop the software architecture for My Service Station System, there are a few design decisions, which have to be answered by the software engineer.

- i. State the suitable architecture style for My Service Station System. [NOTE: Your answer must be supported by **ONE (1)** reason]

[4 marks]

- i. Draw the architecture style based on what you have proposed in **part b(i)**. [NOTE: Show the suitable sub-systems in your architecture style].

[5 marks]

- ii. State the control strategy suitable to control the operation of the components in the system . [NOTE:Your answer must be supported by **ONE (1)** reason, and an appropriate diagram of the control strategy for My Service Station System.]

[6 marks]

5. a. Suppose a buy-online-ticket application for a theme park is selling tickets at prices as shown in **TABLE Q5**. The application will ask the buyer for his age, and it will then identify the required price for the ticket.

TABLE Q5 Ticket Prices

Ticket Type	Price
1-Day Child Ticket (Age: 3-11)	RM 80
1-Day Adult Ticket (Age: 12-59)	RM 140
1-Day Senior Ticket (Age: 60-75)	RM 110

List all valid and invalid equivalence classes based on **TABLE Q5**.

[5 marks]

- ii. Design test case using the equivalence class you have identified in **part a(i)**.

[5 marks]

b. Study the code in **FIGURE Q5**.

```

...
int driver_age, total_risk=1;
char car_type;
cout << "Enter your age AND car type: ";
cin >> driver_age >> car_type;
if (driver_age>=20 && driver_age<=25)
    total_risk = total_risk + 10;
if (car_type == 'X')
{
    if (driver_age<25)
        total_risk = total_risk + 8;
    else
        total_risk = total_risk + 6;
}
else if (car_type == 'C')
    total_risk = total_risk + 4;
cout << "Your total risk is " << total_risk;
...

```

FIGURE Q5 Code

- i. Draw a flow graph diagram for the codes given in **FIGURE Q5**.

[5 marks]

- ii. Determine the cyclomatic complexity of the flow graph in **part b(i)**.

[2 marks]

- iii. List **THREE (3)** independent path based on your flow graph.

[3 marks]

- END OF PAPER -

