UNIVERSITI
TEKNOLOGI
PETRONAS

FINAL EXAMINATION
MAY 2024 SEMESTER

COURSE	:	**TEB3413 - SOFTWARE REQUIREMENT ENGINEERING**
DATE	:	**9 AUGUST 2024 (FRIDAY)**
TIME	:	**3:00 PM - 6:00 PM (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 **EIGHT (8)** pages in this Question Booklet including the cover page

ii. **DOUBLE-SIDED** Question Booklet.

1. The company you are working for procure a deal to develop a collision advance system. A competitor of the customer introduced such a system three months ago and their sales figures increased rapidly. The system is available in the market and your company also acquired the user handbook of the collision avoidance system of the competitor. The system shall be able to identify pedestrians on the roadside which are walking across the road. These pedestrians are potential hazards to the driver. Therefore, the collision avoidance system shall avoid danger for the driver by early warning alerts. There shall be different types of alerts available, they should be trigger by the threat the pedestrian represents. For the classification of the threat category, it is necessary to know the distance of the pedestrian to the car. Moreover, there is a huge literature base focusing on algorithm to compute the distance. The distance sensors which have already been integrated into the car shall be used by the new system. The system shall be implemented in the local car market, so it is necessary to take the existing rules into account.

   a. Draw the fundamental Requirement Engineering framework.

   [2 marks]

   b. Specify a detailed requirement engineering contexts for the above complete system that could guide you to run the requirement elicitation process.

   [**NOTE**: Please provide any appropriate justifications for stated requirement engineering context]

   [10 marks]

   c. Identify **FOUR (4)** main stakeholders that could complete the requirements elicitation task for this project. Justify.

   [8 marks]

2. Elicitation, documentation, validation and negotiation, and as well as management are the four requirement engineering main activities to meet the main goals of requirements engineering.

a. With examples, illustrate **THREE (3)** main types of requirements' resources.

[6 marks]

b. Prototyping is one of six common requirements elicitation methods.

i. Discuss **ONE (1)** advantage and **ONE (1)** disadvantage of this method

[4 marks]

ii. Propose **TWO (2)** ways to overcome the disadvantage.

[4 marks]

c. Conflicts often arise while eliciting these requirements from different stakeholders who have varying interests and perspectives. Discuss **THREE (3)** basic strategies for resolving data, value, and interest conflicts.

[6 marks]

3. Fred's main concerns are that watching movies should be easy and enjoyable. By easy, he means that it should be convenient, low cost, and involve minimal waiting. By enjoyable, he means the movie should have a high picture quality, and it should play reliably. He has experienced two ways of watching movies: DVDs and downloads. He finds downloads to be very cheap, while DVDs are not. For DVDs, he first has to rent the DVD, and then play it. He can rent DVDs from his corner store, which is very convenient, or from a mail order service, which is very inconvenient, and involves a long wait. For downloads, he has to first download the movie, and then stream it to his TV. Downloading is slightly inconvenient, as he has to wait a little while. He finds that playing DVDs gives him high quality picture and a reliable playback, while streaming downloads to his TV is neither high quality nor reliable.

a. Draw a goal model to represent the above information elicited from the stakeholder.

[**NOTE**: Your goal model can use any suitable notation, but must distinguish soft goals from hard goals, and different types of goal contribution link must be clearly labeled and showing it dependencies. State any assumptions.]

[12 marks]

b. Explain **FOUR (4)** main scenarios that could represent the goal model from the above information elicited.

[**NOTE**: Your scenarios must be clear, detailed and justified, you can use any suitable notation to illustrate the scenarios. State any assumption.]

[8 marks]

4. a. Your small company with a very limited budget has secured the project. The project is to classify system features of a customer corresponding to the Kano classification. Based on the development requirement from the project sponsor, not all the system features are compulsory to be produce or implement at the same time. Table 1.0 shows the system features.

Table Q4a: System Features

SF1	The battery capacity shall be at least one week by high usage.
SF2	The smartphone shall enable the user to call another device .
SF3	The smartphone shall provide an autocomplete feature for text message.
SF4	The system shall also include swipe technology to enable the user for faster writing.
SF5	The smartphone shall be extra thin and foldable.
SF6	The smartphone shall be able to connect to WiFi and Bluetooth.
SF7	The smartphone phone shall include as internal storage capacity of 10GB .
SF8	The smartphone shall be enabled for geotagging.
SF9	The smartphone shall have at least 20-megapixel camera sensor.
SF10	The smartphone shall be enabled for NFC tag data transfer.
SF11	The smartphone shall be enabled to work with any IOS or Android apps.
SF12	The smartphone shall be enabled to produce hologram for holographic video chat.

Based on the requirement and list of system features above, categorize each feature corresponding with the Kano classification schema.

[**NOTE**: The classification must be traceable and justified.]

[10 marks]

b. Your colleague asked you to check the natural language requirements (NLR) he documented for a college system (CS) as stated below. You have checked and found out the transformation needed to get a complete and understood requirements.

Table Q4b: System Features

R1	If the student passes an exam, the students' grade shall be submitted to the examination office.
R2	The registration shall take no longer than 30 seconds.
R3	Lecturers shall be able to see all the students' grades.
R4	User shall be able to edit data.
R5	The CS shall submit the students' grade.

For each NLR, trace the requirement and correct it accordingly. Justify.

[5 marks]

c. Describe the difference between the Semiotic Triangle and the Semiotic Tetrahedron in terms of the key concepts.

[5 marks]

5. a. A new car parking management system is to be developed so that driver can scan for empty lot or to look up for his or her parked vehicle from a smart device. Requirements have been collected from various stakeholders, including driver and operator of the car park. Since this new system has no existing reference system, some requirements are either unclear or conflicting. Explain **ONE (1)** technique for validating requirements.

[NOTE: Explanation should include description, an advantage of the technique and justification of its suitability for this scenario.]

[5 marks]

b. Given the following list of functions of an embedded system inside a Global Positioning System (GPS) device. The embedded system assists driver in getting from current position to a desired destination: -

- First, a driver inputs desired destination.
- The `calculate_route` function refers to map data store and determines the route.
- The calculated route is stored in a route data store.
- The GPS device inputs the current position of the vehicle into the system's `track_position` function.
- The `track_position` function will send the current location of the vehicle to the update route function.
- The `update_route` function will constantly inform the driver of the route to be taken.

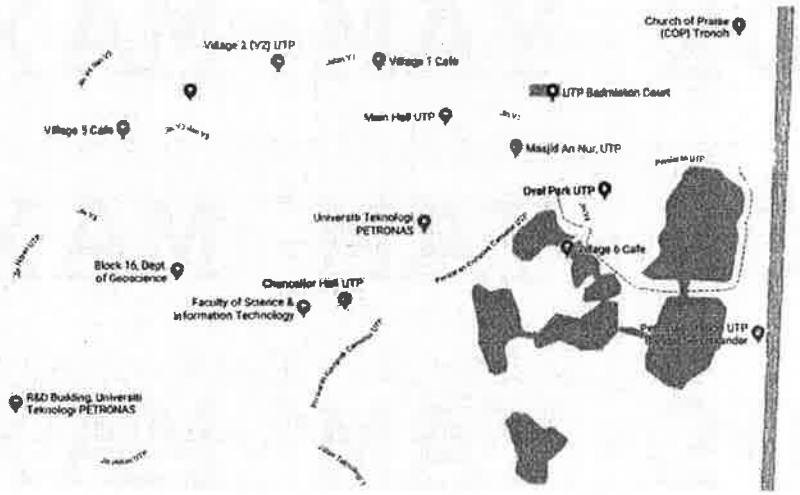
Draw a Data Flow Diagram (DFD) as the functional model of the system.

[NOTE: Please show the system boundary clearly and uses the correct notation for sources, sinks, functions, data flows and data store.]

[10 marks]

c. Examine maps in **FIGURE Q5**.

Map A



Map B

FIGURE Q5

Describe the transformation of Map A to Map B from the perspective of conceptual modelling properties in Requirements Engineering.
[**NOTE:** Include the rational of such a transformation.]

[5 marks]

-END OF PAPER-