

CASE STUDY

CAR PARK SYSTEM - CPS

Informatics Computer School of Singapore plans to introduce a security system in its car parking facility. All the members of the institute, employees and students, who want car parking facility must get parking card. The parking card includes a unique card number, card owners name, department to which attached, date of issue and expiry date.

At the entrance to the car park of the institute, there will be: a display unit that shows the parking space availability, a barrier bar and a card reader. When a vehicle enters the scan area, the car owner / driver sees the parking space availability. If parking space is available, the owner / driver inserts the parking card into the card reader. The card reader scans the card and checks the validity of the card. If the card is valid, the reader sends a signal to raise the barrier and the card is released. The owner / driver then collects the card and enters the car park and the barrier is lowered. The card reader also records the date and time of the entry and updates the parking space availability in the database.

At the exit, the same card is used to raise the barrier. When a vehicle leaves the campus, the display detail changes accordingly and the time at which the car left the campus is also recorded.

Visitors have to report to the car park attendant, where details of the visitor (Identity card number, name, address, purpose of visit) and their vehicle registration number are collected and a special visitor card is issued to use the car park. The Visitor's card will be automatically collected back when the visitor's car leaves the campus.

At the end of the day, reports are produced, which shows the use of the car park by the members of the institute and by the visitors. The report includes member / visitor detail, car detail, time of entry and time of leaving the campus.

ANSWER ANY TWO QUESTIONS

All Questions are based on the case study CAR PARK SYSTEM - CPS given in this question paper. Students will be given the case study to read ONE day before the examination. But they are required to leave the case study at home, and get given a fresh one during the examination.

QUESTION 1

(a) There are several ways to view the collection of user requirements. Explain the following:

- (i) Functional Requirements
- (ii) Non-functional Requirements

[4 marks]

(b) List the use cases available in the car park system and draw an use case diagram. Include at least two <<extend>> and <<include>> links in the use case diagram.

[28 marks]

(c) Also explain when to use <<extend>> and <<include>> in the use case diagram.

[4 marks]

(d) One of the important use case in CAR PARK SYSTEM - CPS is “enter car park”.

Write a detailed use case description for the use case “enter car park” providing the

- Characteristics information (such as primary actor, secondary actors, description of the use case, precondition, post condition and the trigger for the use case).
- All the actions steps main scenario required to be performed for the stated use case.
- Alternative actions / extensions including the recovery steps.
- Variations in the Technology and Data.

[14 marks]

[TOTAL FOR QUESTION 1: 50 MARKS]

QUESTION 2

(a) Draw a UML Class diagram for the proposed CAR PARK SYSTEM - CPS. The class diagram must include the followings:

- Classes with attributes and operations.
- Associations among the classes and multiplicity specification of the associations.
- Association class.
- Inheritance - super type / subtype classes.
- Composition and Aggregation.

[32 marks]

(b) Some kinds of Whole-Part structures are known as “strongly-owned” or as a composition, (these are when you would use a solid diamond in the diagram). Explain what this term means and give an example of a strongly owned Whole-Part structure and an example of one that is not strongly owned.

[8 marks]

(c) Briefly outline the potential benefits and the potential risks of using the object oriented approach to system development.

In your view, do the potential benefits outweigh the potential risks and why?

[10 marks]

[TOTAL FOR QUESTION 2: 50 MARKS]

QUESTION 3

- (a) How the object types within our model interact with each other and the actor(s) in order to perform the designated tasks can be explained by means of sequence diagram. Draw the sequence diagram for the use case “enter car park “of CPS.

[20 marks]

- (b) Imagine that you are managing the analysis and design of the new system. Explain to the CAR PARK SYSTEM - CPS management's various options for prototyping and make a recommendation about which one should be used for this project, giving reasons for your choice.

Also explain how it will be integrated into the systems development life cycle in order to speed up the development.

[18 marks]

- (c) Sequence diagrams and Collaboration diagrams are alternate representations of interaction diagrams. Compare and contrast sequence diagram and collaboration diagram.

[12 marks]

[TOTAL FOR QUESTION 3: 50 MARKS]

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