

ICT340

End-of-Course Assessment - January Semester 2024

Application Analysis and Design

INSTRUCTIONS TO STUDENTS:

1. This End-of-Course Assessment paper comprises **6** pages (including the cover page).
2. You are to include the following particulars in your submission: Course Code, Title of the ECA, SUSS PI No., Your Name, and Submission Date.
3. Late submission will be subjected to the marks deduction scheme. Please refer to the Student Handbook for details.

IMPORTANT NOTE

ECA Submission Deadline: Monday, 08 April 2024 12:00 pm

ECA Submission Guidelines

Please follow the submission instructions stated below:

This ECA carries 70% of the course marks and is a compulsory component. It is to be done individually and not collaboratively with other students.

Submission You are to submit the ECA assignment in exactly the same manner as your tutor-marked assignments (TMA), i.e. using Canvas. Submission in any other manner like hardcopy or any other means will not be accepted.

Electronic transmission is not immediate. It is possible that the network traffic may be particularly heavy on the cut-off date and connections to the system cannot be guaranteed. Hence, you are advised to submit your assignment the day before the cut-off date in order to make sure that the submission is accepted and in good time. Once you have submitted your ECA assignment, the status is displayed on the computer screen. You will only receive a successful assignment submission message if you had applied for the e-mail notification option.

ECA Marks Deduction Scheme

Please note the following:

(a) Submission Cut-off Time – Unless otherwise advised, the cut-off time for ECA submission will be at 12:00 noon on the day of the deadline. All submission timings will be based on the time recorded by Canvas.

(b) Start Time for Deduction – Students are given a grace period of 12 hours. Hence calculation of late submissions of ECAs will begin at 00:00 hrs the following day (this applies even if it is a holiday or weekend) after the deadline.

(c) How the Scheme Works – From 00:00 hrs the following day after the deadline, 10 marks will be deducted for each 24-hour block. Submissions that are subject to more than 50 marks deduction will be assigned zero mark. For examples on how the scheme works, please refer to Section 5.2 Para 1.7.3 of the Student Handbook. Any extra files, missing appendices or corrections received after the cut-off date will also not be considered in the grading of your ECA assignment.

Plagiarism and Collusion

Plagiarism and collusion are forms of cheating and are not acceptable in any form of a student's work, including this ECA assignment. You can avoid plagiarism by giving appropriate references when you use some other people's ideas, words or pictures (including diagrams). Refer to the American Psychological Association (APA) Manual if you need reminding about quoting and referencing. You can avoid collusion by ensuring that your submission is based on your own individual effort. The electronic submission of your ECA assignment will be screened through a plagiarism detecting software. For more information about plagiarism and cheating, you should refer to the Student Handbook. SUSS takes a tough stance against plagiarism and collusion. Serious cases will normally result in the student being referred to SUSS's Student Disciplinary Group.

(Full marks: 100)

Question 1

Read the system requirements of PickMeNow in the Appendix and submit answers to the following:

Question 1a

(i) Identify the Actors in the system. (5 marks)

(ii) Formulate a use case diagram to depict the PickMeNow system design.

Your use case diagram should show the actors, the use cases and their relationships.

(13 marks)

Question 1b

The following is an extract of the requirements of the PickMeNow system:

"PickMeNow is a unique taxi-booking experience that allows customers to access drivers. Customers can just select a destination and then wait for his taxi to arrive. Payment is also easy with a choice of cash or credit card. If the customer changes his mind, he can always cancel without any penalty."

Analyse the above requirements to identify and explain any **TWO (2)** ambiguous, incorrect, incomplete or inconsistent inadequacies of the system design.

Note that in your answers, you are not supposed to use imagination to add anything not mentioned in the requirements. Further, do not include general commentaries in your answer.

(4 marks)

Question 2

Develop a structural model for the food ordering system design, by submitting your answers to the following:

Question 2a

Complete the class description by identifying classes, their attributes and any hierarchical relationship(s) that would be required for the application.

(15 marks)

Question 2b

Appraise the associations among the classes and hierarchical relationship(s) that would be required for the application. Construct the class association diagram in UML as your answer. Ensure that you do not include any derived or redundant association in your diagram.

(15 marks)

Question 3

Analysis on the requirements for the driver give rise to an updated class diagram which allows a driver to accept a ride and update the ride status to "Driver Assigned", part of which is shown in Figure Q3 below.

Note that this may not be applicable to Question 2 above.

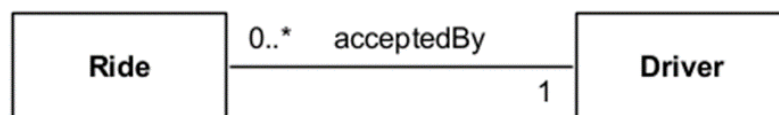


Figure Q3

Consider the following walkthrough:

Objective: To accept a ride

Given: a driverId and a rideReference

1. Locate the instance, aRide, of Ride with the rideReference, linked to the orchestrating object via hasRide.
2. Locate the instance, aDriver, of Driver with the driverId, linked to the orchestrating object via hasDriver.
3. Create an association, acceptedBy, between aRide and aDriver.
4. Update the attribute status of aRide to "Driver Assigned".

Question 3a

Develop the dynamic model for the application function, by drawing the sequence diagram for the walkthrough to accept a ride so that a driver is assigned.

(8 marks)

Question 3b

Implement the method in the following classes that is responsible for accepting a ride and assigning a driver:

(i) the orchestrating class

(4 marks)

(ii) the Ride class

(4 marks)

Question 4

Demonstrate the construction of a component in the PickMeNow system by submitting your answers to the following:

Draw the state diagram for a `Ride` object as it passes through the system.

(14 marks)

Question 5

Demonstrate the application of the observer pattern in the PickMeNow system by submitting your answers to the following:

Question 5a

Develop a structural model of the system that uses the observer pattern by constructing the class association diagram that allows an administrator to register interest in receiving feedback and as soon as a customer gives a feedback, the administrator will be informed to process the feedback.

(8 marks)

Question 5b

Implement the concrete classes for the structural model in Question 5(a).

(10 marks)

Appendix:

PickMeNow is a new taxi company which has started its operations recently. In order to meet the transportation needs of their customers, PickMeNow has decided to invest in an IT solution to connect their customers and support their drivers. Some key features and business requirements of PickMeNow are described below.

Drivers and customers are required to register with PickMeNow by providing: a name, contact number and an email address. PickMeNow assigns an identification number to each registered driver and customer. In addition, each driver is required to provide the details of his bank account (account number and bank name) and vehicle details as described in the next paragraph. Drivers can choose to transfer any amount in his PickMeNow account to his bank account.

Customers need to key in their pick-up and drop-off locations to obtain an estimated fare before booking. If the customer accepts, a driver who wishes to provide the ride would accept the booking. The driver's location and arrival time will be then be displayed in real time to the customer.

PickMeNow allows customers to choose from three types of vehicle: cars, vans and excursion buses. For each vehicle, it is required to capture the licence plate number, brand and model. When a customer books a car, he can choose to cancel. If he or she cancels after 5 minutes of booking, a \$4 surcharge will apply. When a customer books an excursion bus or a van, he or she has to make an upfront deposit amount. The deposit will be returned to the customer if the booking is not cancelled by the customer. For vans, there is a booking fee on top of the trip fare. Although a customer can cancel a booking for an excursion bus or a van, the deposit is forfeited if the cancellation is received 3 days before the date of the ride.

The data to be kept for each ride include: reference number, driver and customer details (identification number and name), fare, pick-up point, destination, distance, date, start time and end time of the ride. At the end of each ride an e-receipt is created and sent to the customer's email address. At the same time, the driver's account will be credited with the amount of the fare minus any fee due to PickMeNow.

A ride can go through the following states during its lifecycle: Ride Requested, Driver Assigned, Customer Cancelled, Driver Cancelled, Customer Waiting, Driver Arrived, Ride Started, Payment Done, Ride Done, Rated.

After completing a ride, customers can accumulate points. After completing rides worth a total of \$500, the customer will become a Premium customer. Only Premium customers can redeem their points to pay their bill in full. Points may be used to offset a customer's bill and if there are insufficient points, the rest of the bill must be paid using a credit card.

After each ride, drivers and customers can rate each other from 1 to 5 stars based on their ride experience. Customers can also give compliments or complaints about the drivers by writing a short review. An administrator of the system reviews the ratings and feedback and records the follow-up action taken.

----- END OF ECA PAPER -----