UNIVERSITY OF WESTMINSTER

SCHOOL OF COMPUTER SCIENCE & ENGINEERING

Module Title: **Database Systems**

Module Code: **5COSC002W & 5COSC008C**

Exam Period: **January 2020**

Time allowed: **1 hour and 30 minutes**

INSTRUCTIONS FOR CANDIDATES

You are advised (but not required) to spend the first five minutes of the examination reading the questions and planning how you will answer them.

This examination paper contains 4 questions.

ALL 4 QUESTIONS ARE COMPULSORY, ANSWER ALL QUESTIONS

QUESTION 1 CARRIES 10 MARKS
QUESTION 2 CARRIES 10 MARKS
QUESTION 3 CARRIES 10 MARKS
QUESTION 4 CARRIES 10 MARKS

The examination is marked out of 40 marks (it is worth 40% of the overall module assessment).

THIS PAPER MUST NOT BE TAKEN OUT OF THE EXAMINATION ROOM

DO NOT TURN OVER THIS PAGE UNTIL THE INVIGILATOR INSTRUCTS YOU TO DO SO

VehiMotion is a vehicle rental company that allows customers to rent out a range of vehicles for their own personal needs or for commercial purposes.

VehiMotion is seeking to design and develop a database-driven management system help organise the rentals of vehicles by customers and the repair maintenance of vehicles by staff.

The Conceptual Entity-Relationship Diagram (ERD) for the vehicle rental and maintenance management system for VehiMotion is shown below (figure 1). Carefully consider this conceptual ERD and answer the questions below.

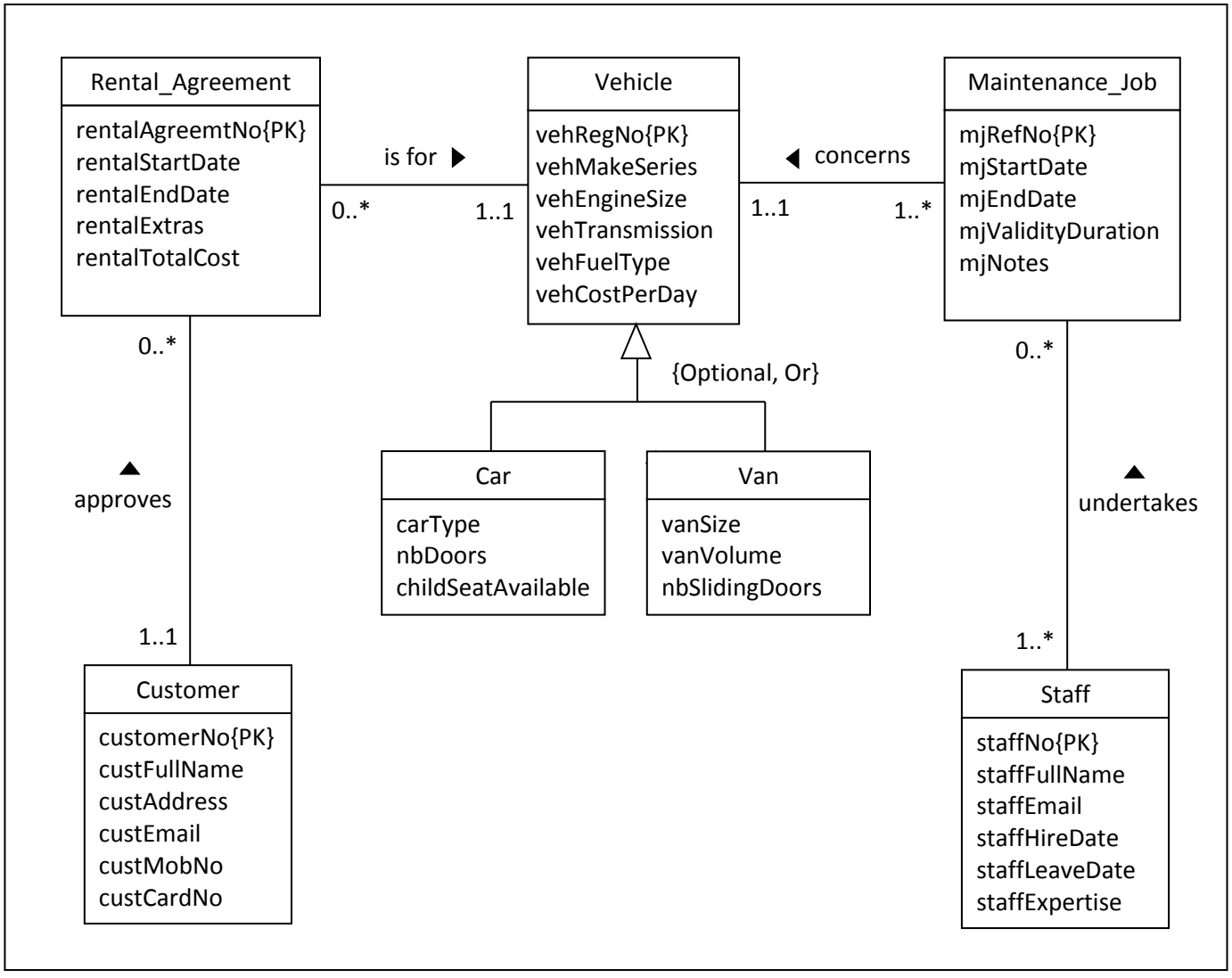

Figure 1: Conceptual ERD for the VehiMotion rental and maintenance management system.

Question 1

(a) Explain in detail the multiplicities of the relationship *'approves'* (between the entities Customer and Rental_Agreement) by providing 4 meaningful statements. Also provide adequate justifications to support each statement.

[4 Marks]

(b) Explain how you would map to a logical ERD the relationship *'approves'* (between the entities Customer and Rental_Agreement). Provide a clear diagram to support your answer. Make sure you include all the correct elements in your diagram e.g. relationships, multiplicities, attributes, and keys.

[6 Marks]

Question 2

(a) Explain in detail the multiplicities of the relationship *'undertakes'* (between the entities Staff and Maintenance_Job) by providing 4 meaningful statements. Also provide adequate justifications to support each statement.

[4 Marks]

(b) Explain how you would map to a logical ERD the relationship *'undertakes'* (between the entities Staff and Maintenance_Job). Provide a clear diagram to support your answer. Make sure you include all the correct elements in your diagram e.g. relationships, multiplicities, attributes, and keys.

[6 Marks]

Question 3

(a) Explain in detail what the connection is between the entity Vehicle and the entities Car and Van, and what this technique is used for. As part of your answer, explain the {Optional, Or} constraint and discuss attribute inheritance in this situation.

[4 Marks]

(b) Explain how you would map to a logical ERD the connection between the entity Vehicle and the entities Car and Van. Provide a clear diagram to support your answer. Make sure you include all the correct elements in your diagram e.g. relationships, multiplicities, attributes, and keys.

[6 Marks]

Question 4

(a) Write a SQL query to display the registration numbers and the makes and series of the vehicles that, either have an automatic transmission and run on petrol fuel, or that have an engine size greater than 1.8 litres.

[5 Marks]

[Please Turn Over]

(b) Write a SQL query to display the customers' full names and the total costs of their rentals for those customers who approved rental agreements that started after the 4th October 2019.

[5 Marks]

END