

School of Computing and Information Technology**Student to complete:**

Family name	<input type="text"/>
Other names	<input type="text"/>
Student number	<input type="text"/>
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**CSCI235
Database Systems****Final Examination Paper
Session 2 2021**

Exam duration	3 hours and 40 minutes
Weighting	40% of the subject assessment
Marks available	40 marks
Items permitted by examiner	Text-book, Lecture slides, and Tutorial notes
Directions to students	4 questions to be answered. Marks for each question are shown beside the question. All answers must be written in the answer booklet provided.

This examination is a take-it-home examination to be done on-line on the date of examination.

Question 1 – (Total 10 marks)

Functional Dependency and Normalization

Time allocated: 45 minutes

Start time: 10:00 am SGT

End time: 10:45 am SGT

Submission time start: 10:40 am SGT

Submission time end: 10:55 am SGT

- a) Consider the relational schemas given below and the respective sets of functional dependencies valid in the schemas. For each one of the relational schemas **identify its highest normal form**. Remember the identification of a normal form requires analysis of the valid **functional dependencies** and the **minimal keys**. **A solution with no comprehensive analysis of the valid functional dependencies and the minimal keys scores no marks.**

i. $R_2 = (A, B, C)$

$$F = \{A \rightarrow B, B \rightarrow A\}$$

(2.0 marks)

ii. $R = (A, B, C)$

The attributes A, B, and C do not have any functional dependency among them.

(2.0 marks)

- iii. Each customer is described by a unique customer number, a customer name, an address, and a postal code. Addresses are organized such that each address is associated to one postal code. A customer owns many different types of credit card, such as Visa or Master, and each credit card is described by a credit card number, a credit card type, and an expiry date. The information described are stored in a relational table CustomerCreditCard as shown here:

CustomerCreditCard(custNum, custName, address, postalCode, cardType, cardNumber, cardExpDate)

(2.0 marks)

b) Considering the un-normalized relational table CLEANING-SCHEDULE below:

ABC is an international company that owns many buildings in a Science Park. In the current COVID-19 situation, company ABC has increased its cleaning activities. A group of cleaners are engaged to clean the company's buildings several times a day. Groups of 5 cleaners will be assigned to each building each day. Cleaners are not attached to any specific rooms within a building, that is, cleaners are able to clean any rooms. Once a cleaner has finished cleaning a room, the cleaner can move on to clean the next room schedule to be cleaned in a cleaning roster for the building. In addition, there may be more than one cleaners cleaning one room at a time. The room number is unique within a building, but is not across the company.

The company stores the information about the cleaning schedule for the building in the following relational table:

CLEANING-SCHEDULE(bldgNum, date, roomNum[1..*], roomSittingCapacity, cleanerNum[1..*])

Decompose the relational table CLEANING-SCHEDULE into a minimal number of relational tables in 4NF.

(4.0 marks)

END OF QUESTION 1