School of Computing and Information Technology

Student to complete:

Family name	
Other names	
Student number	
Table number	

CSCI235
Database Systems

Final Examination Paper
Session 4 2021
(1 December 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.

Version 2.0

Question 1 – (Total 10 marks)
Functional Dependency and Normalization

Time allocated: 45 minutes
Start time: 2:15 pm SGT
End time: 3:00 pm SGT
Submission time start: 2:55 pm SGT
Submission time end: 3:10 pm SGT

a) Consider a relational schema given below and the set of functional dependencies valid in the schema. For the specified relational schema R2, **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**.

R2 = (A, B, C, D, E, F)

The following functional dependencies stand:

- $B \rightarrow D$
- $E \rightarrow F$
- $D \rightarrow E$
- $D \rightarrow B$
- $F \rightarrow BD$

(3.0 marks)

b) Consider the specification of the sample database domain and the relational table CustomerCreditCard given below. Discover the valid functional dependencies in the table, and **identify its highest normal form**. **Provide justification for your answer. A solution with no comprehensive justification scores no marks**.

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 type 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)

(3.0 marks)

c) Considering the un-normalized relational table BOOK below:

BOOK (ISBN, BookTitle, AuthorFName, AuthorLName, Publisher, Royalty, Edition)

The attributes of the relational table BOOK satisfy the following properties:

- An ISBN (International Standard Book Number) is unique to each book title, the publisher of the book, and the edition the book.
- Book title is unique to a publisher.
- The author is paid a royalty for each book (identified by ISBN) the author wrote.

Decompose the relational table BOOK into a minimal number of relational tables in BCNF (Boyce-Codd Normal Form).

(4.0 Marks)

END OF Question 1