SIM GLOBAL EDUCATION

UNIVERSITY OF WOLLONGONG AUSTRALIA

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 2020
(2 December 2020)

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	Answer all the 4 questions. Marks for each question are shown beside the question. All answers must be hand-written in A4-size or foolscap paper.

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

Version 3.0

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 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(A, B, C, D, E)`

$AD \rightarrow BC$
$D \rightarrow A$

(2.0 marks)

(ii) `R(A, B, C, D, E)`

$ABC \rightarrow D$
$D \rightarrow A$

(2.0 marks)

(iii) In a product promotion fair, promoters are engaged to promote various products. A promoter may promote more than one product, and each product may be promoted by many promoters. A promoter is paid by commission, and the commission is computed based on a total sale for the product, for example, if the total sale for a product is below $1000, a promoter is paid 10% of the total sale for commission; if the total sale for a product is between $1000 and $5000, a promoter is paid 20%, etc. The information about the commission are stored in the following relational table.

`COMMISSION (PromoterId, ProductId, TotalSale, CommissionPaid)`

Identify the highest normal form of the relational table. **(2.0 marks)**

b) Considering the un-normalized relational table PROJECT below:

PROJECT (ProjectTitle, EmpeName, ManagerName, Location, HoursWork, ManagerPhone)

The attributes of PROJECT table satisfy the following properties:

- Each project has many employees,
- Each employee may involve in one or more projects,
- Projects are managed by managers; there are many managers in the company, hence a project may be assigned to any one of the managers, but each manager manages only one project.
- Each project is located in a specific location,
- The number of hours an employee works at each project is determined by a project title and the employee name.
- Each manager has a telephone number.

Normalize the relational table PROJECT into a minimal number of relational tables in BCNF. Use the functional dependencies to prove that each one of the relational tables obtained from the decomposition of the original table is in BCNF. **(4.0 marks)**

========== End of Question 1 ==========