THE UNIVERSITY OF NEW SOUTH WALES

SCHOOL OF INFORMATION SYSTEMS AND TECHNOLOGY MANAGEMENT

TERM 2 2021

INFS1603: INTRODUCTION TO BUSINESS DATABASES/

COMM1822: INTRODUCTION TO DATABASES FOR BUSINESS ANALYTICS

FINAL EXAMINATION

1. Time Allowed: 24 Hours.
2. This is a Take-Home Exam, your responses must be your own original work. You must attempt this Take-Home Exam by yourself without any help from others. Thus, you have **NOT** worked, collaborated or colluded with any other persons in the formulation of your responses. The work that you are submitting for your Take-Home Exam is your **OWN** work.
3. Release date/time (via Moodle): **Monday 23 August 2021 9:00am** (Australian Eastern Time Zone)
4. Submission date/time (Via Turnitin): **Tuesday 24 August 2021 9:00am** (Australian Eastern Time Zone)
5. Failure to upload the exam by the submission time will result in a penalty of **15%** of the available marks per hour of lateness.
6. This Examination Paper has **6** pages, including the cover page.
7. Total number of Questions: **3** Questions.
8. Answer all **3** Questions.
9. Total marks available: 100 marks. This examination is worth **50%** of the total marks for the course.
10. Questions are not of equal value. Marks available for question sub-parts are shown on this examination paper.
11. Some questions have word limits as indicated on the question. These word limits must be adhered to. Text in excess of the specified word limit(s) may not be considered in the marking process.
12. Candidates **must** submit a signed Declaration Form together with the Take-

Home Exam answer document. Failure to submit the signed Declaration Form may result in your Take-Home Exam answer sheet not being marked.

13. Answers to questions are to be written in the template provided. Please ensure that you provide the following details on your Take-Home Exam answer sheet:
    - Student ID:
14. In accordance with the Declaration Form, this Take-Home Exam paper cannot be copied, forwarded or shared.
15. Students are reminded of UNSW's rules regarding Academic Integrity and Plagiarism. Plagiarism is a serious breach of ethics at UNSW and is not taken lightly. For details see Examples of plagiarism.
16. This Take-Home Exam is an open book/open web, further information is available "Here".
    - You are permitted to refer to your course notes, any materials provided by the course convenor or lecturer, books, journal articles, or tutorial materials.
    - It is sufficient to use in-text citations that include the following information: the name of the author or authors; the year of publication; the page number (where the information/idea can be located on a particular page when directly quoted), For example, (McConville, 2011, p.188).
    - You are required to cite your sources and attribute direct quotes appropriately when using external sources (other than your course materials).
    - When citing Internet sources, please use the following format: website/page title and date.
    - If you provide in-text citations, you MUST provide a Reference List. The Reference list will **NOT BE** counted towards your word limit.
17. Students are advised to read the Take-Home Exam paper thoroughly before commencing.
18. The Lecturer-in-Charge (LiC) / Exam Referee will be available online (via Moodle) after the Take-Home Exam paper is released for a period of two hours.

QUESTION 1 **50 MARKS**

Scenario:

The ABC Paediatric Institute is a medical institute located in Sydney, NSW, that specializes in medical care of infants and children. The ABC Paediatric Institute is dedicated to providing high-quality paediatric services and building connections with the local community.

As a large paediatric service organization, ABC Paediatric Institute depends on a large number of persons for its continued operations. There are five groups of persons on whom the institute is most dependent: support staff, physicians, clients, nurses, and technicians. Some common attributes are shared by all of these persons: PersonNumber (identifier), FirstName, LastName, DateOfBirth, DriverLicenceNo, and Phone. Additionally, nurses have the attribute HighestCertificate (e.g., Registered Nurse (RN) or Enrolled Nurse (EN) etc.) and YearOfNursingExperience. Technicians have the attribute TechLevel (e.g., entry level, associate level, master level). Support staff have the attribute YearOfEmployment. Physicians have the attributes Description and HighestEducation (e.g., Ph.D., M.S., B.S.). Clients have a Contactdate (date of first contact with the institute). Some other persons in the institute do not belong to one of these groups. However, a particular person may belong to two (or more) of these groups at a given time.

The ABC Paediatric Institute has many functional centres (e.g., Audiology Centre, Adolescent Medicine Centre). Each nurse is assigned to one (and only one) centre. The entity centre has attributes including Name (identifier), Description and BuildingID. A centre may have one or more nurses assigned to it. Also, for each centre, one of the nurses assigned to that centre is appointed NurseInCharge. Each physician is working for one (and only one) centre.

Each client has one (and only one) physician responsible for that client. A given physician may not be responsible for a client at a given time, or may be responsible for one or more clients. Each client is scheduled for zero or more visits. The entity visit has such attributes as Date (partial identifier), Description and HasReservation (with values “Yes” and “No”). Notice that an instance of visit cannot exist without the client entity. Each visit has one or two nurses serving that visit.

Each technician is assigned to one or more laboratories (e.g., Genetic Testing lab, Microbiology lab, Blood Testing lab, etc.). Attributes of laboratories include Name (identifier), Description, and Location. A laboratory may have one or more technicians assigned to it.

The ABC Paediatric Institute has three buildings (WestWing, EastWing and MainBuilding). The entity building has attributes BuildingID, BuildingName, and LastMaintenanceTime. A building can host many centres. A centre is in one building. A centre may have one or more exam rooms (up to any number) assigned to it. Exam rooms have attributes including RoomNumber, BuildingID, and MaintenanceTime. Each client must be assigned to one exam room during a visit.

During the pandemic, the centre fully supports the vaccination. The developed database should also be able to store data of the vaccination appointments. Any person can book a vaccine appointment. Each appointment should record information of the AppointmentID, VaccineProvider, and DoseNumber (indicating whether it is for the first or second dose). Additionally, the ABC Paediatric Institute must store the data of all conducted vaccinations tracking corresponding information such as VaccinationTime and ReportedAdverseReactions.

Required:

With reference to the above case, please answer all of the following questions:

a) Using Chen's notation to create an Entity Relationship Diagram (ERD) that provides a suitable model based on the above business rules. Provide your assumptions when necessary. *(25 marks)*

b) Create a relational model for the above scenario. Use the notion as discussed in the lectures to draw a relational model. All relations in your relational model should be in 3NF. *(15 marks)*

c) In your own words, identify and discuss two possible improvements about the database design [max 300 words]. *(10 marks)*

QUESTION 2 **38 MARKS**

b) **Case:** PyJa Institute is an institute set up to manage the exam and certification programs for programming languages. It has hired you to design and implement a database using Oracle. They provide you with the below report extracted from an Excel sheet.

Examinee Number	Examinee Name	Edu Level	Exam ID	ExamVenue Location	Certification ID	Certification Title	Certification Fee	Score
z00108	David Thomas	MS	EA4001	West Wing Room 100	Java100	Java Entry Cert	200	820
z00108	David Thomas	MS	EA8280	East Wing Room 303	Python100	Python Entry Cert	300	800
p10073	Eileen Yoon	PhD	EA4002	West Wing Room 101	Java100	Java Entry Cert	200	630
p10073	Eileen Yoon	PhD	EA8280	East Wing Room 303	Python100	Python Entry Cert	300	900
p10073	Eileen Yoon	PhD	EA8390	East Wing Room 322	Python300	Python Master Cert	500	850

Required:

With reference to the above case, please answer all of the following questions:

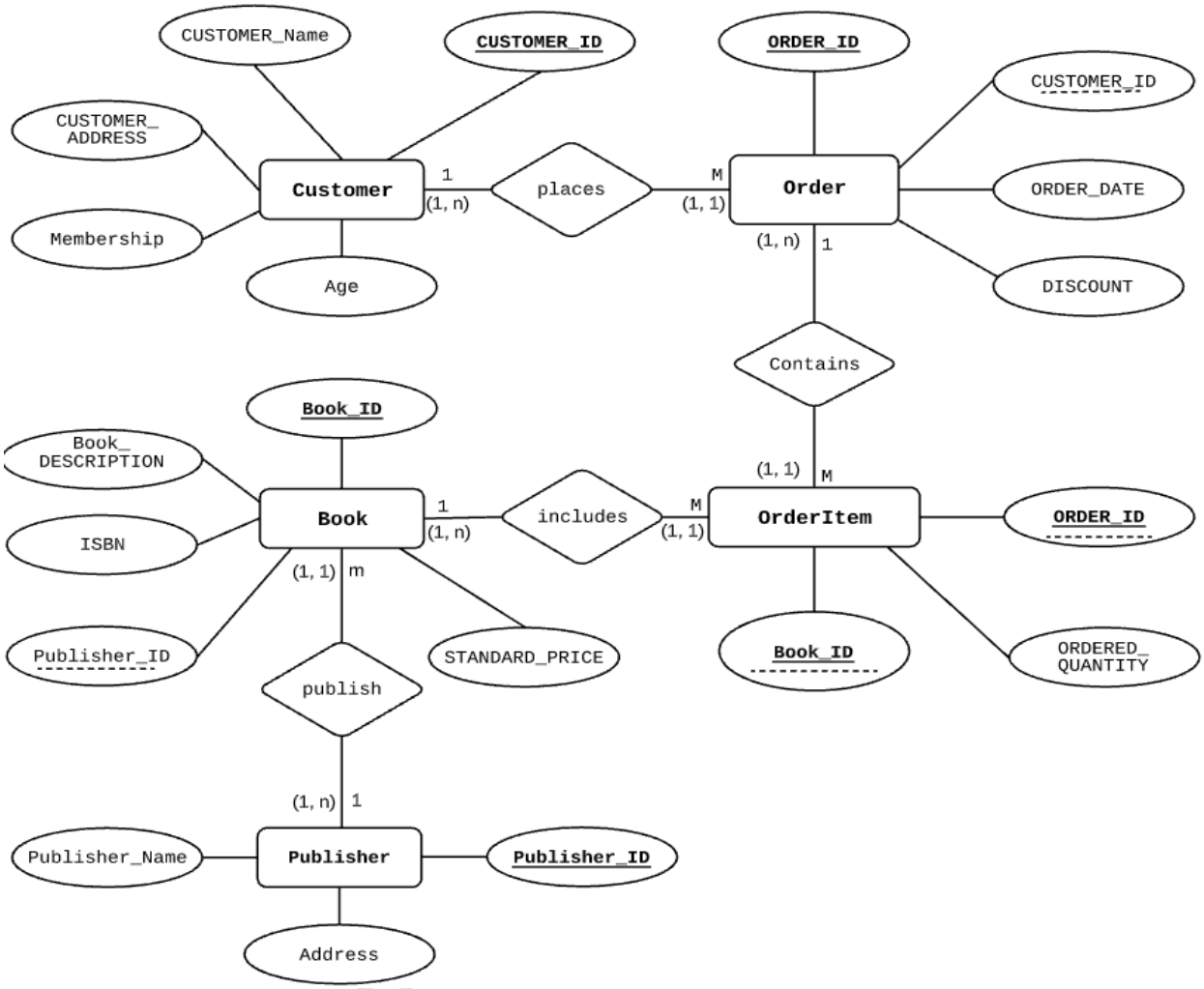
a) List out all partial and transitive dependencies, indicate the primary key, and draw the functional dependency diagram in the First Normal Form (1NF),. *(15 marks)*

b) Create 2NF and 3NF, showing all intermediate steps in the normalization process. Write the relational schemas and indicate all primary keys and foreign keys. *(15 marks)*

c) Assuming your relational schemas in Question 2 (b) are already converted into tables. Write an SQL query (based on Oracle SQL syntax) using SQL Join clause on these tables to create the sample report as shown in Question 2. *(8 marks)*

QUESTION 3 **12 MARKS**

Refer to the ERD given below.



Customer table contains customer details and Customer_ID is the primary key. **Order** contains order details and Order_ID is the primary key. **OrderItem** contains details of order lines for all orders and (Order_ID, Book_ID) forms the primary key. **Book** contains book details and Book_ID is the primary key. **Publisher** contains publisher information and publisher_ID is the primary key. You can assume all tables are already created and all data are inserted.

Write a single SQL query (based on Oracle SQL syntax) for each of the following questions:

a) Display the sales amount of each order in May 2020. *(6 marks)*

b) Display the count of orders from the customers who bought the book with Book_ID "ZBK978922" in 2021. *(6 marks)*

— END OF EXAMINATION PAPER —