

## **WARNING**

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Family Name	
Given Names	
Student Number	
Teaching Period	Semester 1, 2017

<b>FINAL EXAMINATION</b>	<b>DURATION</b>
<b>BIS234 – Database Concepts</b>	Reading Time: <b>10</b> minutes
	Writing Time: <b>180</b> minutes

**INSTRUCTIONS TO CANDIDATES**

**EXAM CONDITIONS**

**You may begin writing from the commencement of the examination session.** The reading time indicated above is provided as a guide only.

This is a RESTRICTED OPEN BOOK examination

No calculators are permitted

One A4 sheet of handwritten **single-sided** notes permitted

No dictionaries are permitted

ADDITIONAL AUTHORISED MATERIALS	EXAMINATION MATERIALS TO BE SUPPLIED
No additional printed material is permitted	1 x 16 Page Book 1 x Scrap Paper

**THIS EXAMINATION IS PRINTED  
DOUBLE-SIDED.**

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BLANK.**

**Problem Solving Questions**  
**Total Number of Marks for this section: 100 Marks**

**This exam should be answered in the Answer Booklet provided.**  
**ALL Question MUST be answered.**

**Marks for each question are indicated**

**Question 1: ER-Diagrams (20 Marks)**

For each of the below scenarios draw a separate E-R diagram including attributes, cardinalities and identifiers when applicable.

- a) Customers identified by a CUST-NAME and have an ADDRESS buy Items from a store. Items are identified by an ITEM-NO and have a DESCRIPTION. The QTY-BOUGHT-OF-AN-ITEM of an item by a customer is recorded. Each customer buys a specific item. **(5 points)**
- b) Projects are identified by a PROJECT-NO and have BUDGETS. Projects are managed by a department. Each department is identified by a DEPARTMENT-NAME and has a FLOOR-NO. Each department manages at least one project and a project can be managed by 2 departments **(5 points)**
- c) An order with a unique ORDER-NO and ORDER-DATE can be made for any number of parts (identified by ITEM-NO and with a COLOR). QTY-ORDERED is the amount of each part ordered. Orders are made to three suppliers (each is identified by a SUPPLIER-NAME and has one ADDRESS). **(5 points)**
- d) A fault occurs on one item of equipment. A log book contains FAULT-NO, FAULT-DATE and FAULT-DESCRIPTION. Each item of equipment has a unique EQUIP-NO and an EQUIP-DESCRIPTION and a TYPE. Each such item is located in one building, which has a unique BUILDING-NAME and one ADDRESS. **(5 points)**

## **Question 2: Relationships - 20 marks**

Consider the following 3NF relations about a sorority or fraternity:

MEMBER(Member\_ID, Name, Address, Dues\_Owed)

OFFICE(Office\_Name, Officer\_ID, Term\_Start\_Date, Budget)

EXPENSE(Ledger\_Number, Office\_Name, Expense\_Date, Amt\_Owed)

PAYMENT(Check\_Number, Expense\_Ledger\_Number, Amt\_Paid)

RECEIPT(Member\_ID, Receipt\_Date, Dues\_Received)

COMMITTEE(Committee\_ID, Officer\_in\_Charge)

WORKERS(Committee\_ID, Member\_ID)

- a) Foreign keys are not indicated in these relations. Decide which attributes are foreign keys and justify your decisions. **(6 marks)**
- b) Draw an E-R diagram for these relations, using your answer in part a. **(6 marks)**
- c) Explain the assumptions you made about cardinalities in your answer to part b. Explain why it is said that the E-R data model is more expressive or more semantically rich than the relational data model. **(8 marks)**

## **Question 3: Vehicle Database SQL statements - 20 marks**

Using the vehicle database in **Appendix A**, write SQL statements for the following queries. The expected answer is given in each case.

- a) Find the cars that were used by Employee's Department as services and sort by Model. **(5 marks)**
- b) Find all employees whose car year is 2009. **(5 marks)**
- c) Find the number of cars used by all employees who are not managers. **(5 marks)**
- d) Find the employees who have taken a Toyota car. **(5 marks)**

## Question 4: E-R Diagrams - 15 marks

Draw an E-R diagram for the scenario below.

A restaurant chain has several store locations in a city (with a name and zipcode stored for each), and each is managed by one manager. Managers manage only one store. Each restaurant location has its own unique set of menus. Most have more than one menu (e.g., lunch and dinner menus). Each menu has many menu items, and items can appear on multiple menus, and with different prices on different menus.

## Question 5: ERD and Relational Schema - 10 marks

Figure 1 shows an ER diagram for a university dining services organization that provides dining services to a university.

- Transform the diagram to a set of relations and develop a relational schema (5 marks)
- Find the functional dependencies in the relations and determine their normal forms (5 marks)

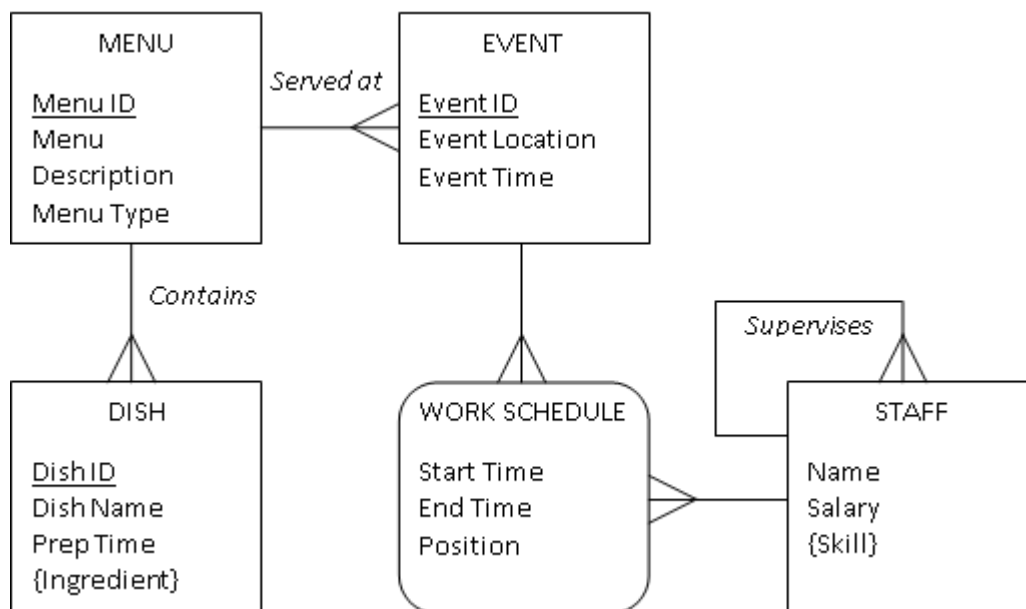


Figure 1 ER Diagram for a university dining services (ref: Modern Database Management, Hoffer et al)

## Question 6 Mapping - 15 marks

### SHIPPING MANIFEST

Shipment ID 00-0001

Shipment Date: 01 /10/2010

Origin: Boston

Expected Arrival: 01/14/2010

Destination: Brazil

Captain: 002-15

Henry Moore

Item Number	Type	Description	Weight	Quantity	Total WEIGHT
3223	BM	Concrete Form	500	100	50,000
3297	BM	Steel Beam	87	2,000	174,000
Shipment Total:					224,000

*Figure 2: (ref: Modern Database Management, Hoffer et al)*

Based on figure 2 above:

- Draw a relational schema and show the dependencies on it. (5 marks)
- In what normal form is this relation? Prove your answer by showing how you reached the solution (5 marks)
- Decompose SHIPPING MANIFEST into a set of 3NF relations. Show all your work (5 marks)

## Appendix A

### Vehicle

Reg No	Make	Model	Year	Colour
BRG446	Ford	Meteor	2009	White
VRG655	Bmw	Coupe	2008	Blue
NMT667	Madza	Delivery Van	2010	Green
CCT899	Toyota	HiLuxe	2009	Red
FGR122	Mitsubishi	Magna	2007	Purple

### Employee Table

Employee_No	FirstName	LastName	Department
118	Riley	Griffin	Business
123	Bryn	Underwood	Information Tech
156	Anna	Thanh	Administration
166	Justin	Brownworth	Business
120	Sarah	McDonald	Services
134	Tammy	Hubber	Manager

### Employee Vehicle Table

Employee_veh	Reg No	Employee_No	Date Taken	Date Returned
A12	BRG446	118	1/09/2011	3/09/2011
A13	NMT667	156	2/09/2011	3/09/2011
A14	CCT899	166	2/09/2011	4/09/2011
A15	FGR122	134	3/09/2011	5/09/2011
A16	BRG446	118	4/09/2011	10/09/2011
A17	NMT667	166	5/09/2011	10/09/2011
A18	NMT667	134	11/09/2011	15/09/2011
A19	FGR122	166	12/09/2011	15/11/2011
A20	NMT667	118	14/11/2011	15/11/2011



## Appendix B

### Automobile

Reg No	Make	Model	Year	Colour
BRG446	Ford	Meteor	2009	White
VRG655	Bmw	Coupe	2008	Blue
NMT667	Madza	Delivery Van	2010	Green
CCT899	Toyota	HiLuxe	2009	Red
FGR122	Mitsubishi	Magna	2007	Purple

### Customer Table

Employee_No	FirstName	LastName	Suburb
A118	Mohamed	Griffin	Nightcliff
A120	Ali	McDonald	Brinkin
A123	Albert	Underwood	Rapid Creek
A134	Sammy	Smith	Casuarina
A156	Anna	Thanh	Coconut Grove
A166	Justin	Brownworth	Nakara

### Customer Automobile Table

Employee_veh	Reg No	Employee_No	Date Taken	Date Returned
B-12	BRG446	A118	1/09/2011	3/09/2011
B-13	NMT667	A156	2/09/2011	3/09/2011
B-14	CCT899	A166	2/09/2011	4/09/2011
B-15	FGR122	A134	3/09/2011	5/09/2011
B-16	BRG446	A118	4/09/2011	10/09/2011
B-17	NMT667	A166	5/09/2011	10/09/2011
B-18	NMT667	A134	11/09/2011	15/09/2011
B-19	FGR122	A166	12/09/2011	15/11/2011
B-20	NMT667	A118	14/11/2011	15/11/2011
B-12	BRG446	A118	15/11/2011	
B-13	NMT667	A156	16/11/2011	
B-14	CCT899	A166	17/11/2011	