

School of Computing and Mathematics**Examination Session 2, 2015****ITC556 Database Systems****Sample Exam**

This paper is for Distance Education (Distance), Study Centre Sydney and Study Centre Melbourne students.

EXAM CONDITIONS:

This is a closed book exam
Notes are NOT permitted in the Exam
No dictionary permitted
The student may NOT retain the question paper

WRITING TIME:

2 hours plus 10 minutes reading time
Writing is permitted during reading time

MATERIALS SUPPLIED BY UNIVERSITY:

1 x 12 page answer booklet
1 x General purpose answer sheet (GPAS)

MATERIALS PERMITTED IN EXAMINATION: Ruler - any type
2B Pencil/Eraser

(No electronic aids are permitted e.g. laptops, phones)

NUMBER OF QUESTIONS:

5

VALUE:

50%

INSTRUCTIONS TO CANDIDATES:

1. Enter your name and student number and sign the space provided below.
2. This is a closed book examination; therefore no written material, reference books or notes will be permitted in the examination room.
3. The examination paper, together with all answer booklets, must be returned at the completion of the examination.
4. Question 1 consists of 20 multiple choice questions, each worth 1 mark. The answers to these must be marked on the GPAS supplied with a 2B pencil.
5. Questions 2-5 consist of short and long answer questions. The marks allocated to each question are indicated. Write your answers in the answer booklet provided.
6. You should answer ALL questions.

STUDENT NAME: STUDENT ID:

SIGNATURE

QUESTION 1

(20 marks in total)

Each question is worth 1 mark

It is to be answered **using a 2B pencil** on the General Purpose Answer Sheet provided, by filling in the circle corresponding to the most appropriate alternative for each part.

Be sure to complete your name (your family name, then a space, then your first given name) and student number (in the identification number field) on this sheet. You do not need to fill in the fields for sex, grade, birth date or special codes.

1. The relational database model enables you to view data ____ rather than ____.
 - a. relationally, hierarchically
 - b. hierarchically, relationally
 - c. physically, logically
 - d. logically, physically
2. No data entry at all is known as a(n) ____.
 - a. nil
 - b. null
 - c. empty
 - d. zero
3. A natural join:
 - a. links rows with common values in joined attributes
 - b. retains duplicate columns
 - c. is also known as an outer join
 - d. used the DIFFERENCE operator
4. A foreign key exhibits "Referential Integrity" if it:
 - a. does not contain nulls
 - b. uniquely identifies a record in the table
 - c. used strictly for data retrieval purposes
 - d. contains nulls or values matching the related table
5. Foreign keys
 - a. must not be null, and go in the table at the "many" end of a "1 to many" relationship.
 - b. must not be null, and go in the tables at both ends of a "many to many" relationship.
 - c. can be null, and go in the table at the "many" end of a "1 to many" relationship.
 - d. can be null, and go in the tables at both ends of a "many to many" relationship.
6. In order to maintain referential integrity when linking multiple tables
 - a. a candidate key must reference a foreign key.
 - b. a foreign key must reference a primary key.
 - c. a primary key must reference a foreign key.
 - d. a primary key must reference another primary key.

7. Which attribute(s) make up the primary key in the table definition?
TRANSACTION (INVOICE_NO, PART_NO, QUANTITY)
- a. INVOICE_NO
 - b. PART_NO
 - c. INVOICE_NO and PART_NO
 - d. There is no primary key
8. Normalisation is a process for assigning _____ to entities.
- a. data
 - b. files
 - c. attributes
 - d. relations
9. Which command uses a natural join?
- a. SELECT product_name, vendor_name FROM product, vendor WHERE product.v_code = vendor.v_code
 - b. SELECT product_name, vendor_name FROM product, vendor
 - c. SELECT product_name, vendor_name FROM vendor LEFT JOIN PRODUCT ON vendor.v_code = product.v_code
 - d. All of the above
10. Which of the following is a reason why a set of normalised tables in a relational database may be unnormalised
- a. data integrity
 - b. query response time
 - c. proper concurrency control
 - d. security
11. A database transaction is said to exhibit atomicity if:
- a. the data used during execution cannot be used by a second transaction until the first one is complete.
 - b. all SQL requests within the transaction must complete successfully or the entire transaction is aborted.
 - c. the database's consistent state is maintained.
 - d. the transaction includes the ROLLBACK statement
12. If a program is abnormally terminated prior to a transaction commit,
- a. the completed transaction parts should immediately be written to disk.
 - b. the database should be rolled back to its previous consistent state.
 - c. the database should be rolled back to the start of the session.
 - d. the transaction should be committed as far as possible.
13. The transaction log stores information used by the DBMS when processing which statement:
- a. COMMIT
 - b. LOCK
 - c. UNDO
 - d. ROLLBACK

14. A _____ lock has only two states.

- a. shared
- b. binary
- c. database
- d. row-level

15. A shared lock would be appropriate for a transaction containing:

- a. only one COMMIT statement
- b. DML statements only
- c. SELECT statements
- d. none of the above

16. Attribute B is functionally dependent on attribute A if:

- a. attribute B determines attribute A.
- b. attributes A and B determine attribute C.
- c. attribute B is the primary key
- d. attribute A determines attribute B.

17. A lost update problem happens:

- a. when a transaction is not committed.
- b. when there is a computer failure.
- c. due to concurrency problems
- d. whenever there is a deadlock.

18. A GROUP BY error occurs when:

- a. used in conjunction with one of the SQL aggregate functions
- b. used with a SELECT statement.
- c. used with an ORDER BY statement
- d. none of the above.

19. To check for null values in a column, use the following WHERE clause:

- a. WHERE column = NULL.
- b. WHERE column = 0
- c. WHERE column IS NULL
- d. WHERE column = "".

20. A transitive dependency occurs between two tables when:

- a. two tables are normalised.
- b. the tables are in Boyce-Codd normal form.
- c. an attribute in one table is dependent on the primary key of another table
- d. two non-key attributes are dependent on each other

QUESTION 2

(25 marks)

Answer all questions.

1. Represent these business rules by means of an Entity Relationship Diagram (10 marks)

- A customer can own many cars.
- Some customers do not own cars.
- A car is owned by one and only one customer.
- A car may generate one or more maintenance records.
- Each maintenance record is generated by one and only one car.
- Some cars have not (yet) generated a maintenance procedure.

2. Create an ERD to represent the below case (15 marks)

Case Study:

You are required to:

1. Draw an Entity Relationship Diagram (ERD) that represents this case study;
2. Resolve any M:N relationships that occur in the ERD.

Origin Energy Australia wishes to create a database with the following entities and attributes:

- Customer, with attributes Customer ID, Name, Address(Street, City, State, ZipCode), and Telephone
- Location, with attributes Location ID, Address(Street, City, State, ZipCode) and Type(values of Business or Residential)
- Rate, with attributes Rate Class and RatePerKWH

After interviews with the owners, you have come up with the following business rules:

- Customers can have one or more locations
- Each location can have one or more rates, depending on the time of day.

Notes:

- The third party payment site is out of scope for this question and can be ignored.
- The ERD must show names for both entities and relationships.
- The ERD must indicate the cardinality (ie. one-to-one, one-to-many or many-to-many) of all relationships.

- The ERD does not need to show attributes.
- List any assumptions that you make.

QUESTION 3

(15 marks in total)

The table below contains sample data for parts and for vendors who supply those parts. In discussing this data with users, we find that part numbers (but not descriptions) uniquely identify parts, and that vendor names uniquely identify vendors.

PART SUPPLIER

<u>Part No</u>	Description	<u>Vendor Name</u>	Address	Unit_Cost
1234	Logic Chip	Fast Chips	Cupertino	10.00
1234	Logic Chip	Smart Chips	Phoenix	8.00
5678	Memory Chip	Fast Chips	Cupertino	3.00
5678	Memory Chip	Quality Chips	Austin	2.00
5678	Memory Chip	Smart Chips	Phoenix	5.00

Source: <http://learnline.cdu.edu.au/units/databaseconcepts/module2/normalisation.html>

1. Develop a diagram that shows the functional dependencies in the Part Supplier relation (6 marks).

2. In what normal form is Part Supplier relation? (3 marks)

3. Convert Part Supplier relation to 3rd Normal Form if necessary and show the referential integrity constraints (6 marks)

QUESTION 4

(20 marks in total)

Answer all questions – Each question is worth 4 marks

Some tables from a hotel booking system database are shown below. Underneath each table is its name, and the primary key is shown inside parentheses.

Booking_ID	Guest_ID	Operator	BookingTime	Hotel_ID	Status
19600	2873	Letty	2014-12-18 23:09:09	97	CONFIRMED
206	80	Kylie	2014-12-18 23:09:09	127	CANCELLED
207	83	Yayoi	2014-12-18 21:58:28	127	CANCELLED
8481	1440	Sandy	2014-10-19 22:55:28	180	CANCELLED
209	83	Yayoi	2014-12-18 23:09:22	127	CANCELLED
210	4	Kate	2014-12-18 23:09:09	127	CANCELLED
211	83	Kate	2014-12-18 23:08:56	127	CANCELLED
212	84	Kate	2014-12-18 23:29:42	127	CANCELLED
213	85	Sarah	2014-12-19 22:06:16	326	CONFIRMED
214	86	Gorlina	2014-12-19 22:12:33	312	CONFIRMED
215	84	Kate	2014-12-19 22:16:54	310	CONFIRMED
216	87	Linda	2014-12-19 22:19:53	313	CONFIRMED
217	88	Danielle	2014-12-21 03:51:37	107	CONFIRMED
218	89	Skye	2014-12-21 04:15:24	92	CONFIRMED
19599	4393	Vesna	2014-09-20 01:40:33	268	CONFIRMED
220	88	Corey	2014-12-21 04:36:19	168	CONFIRMED

tbBookings (Booking_ID)

Detail_ID	BookingID	RoomType	Guest_Name	CheckIn	CheckOut	Price
1446	207	16	Barry Staines	2014-12-30	2014-01-02	\$440.00
1448	206	4	Barney Rubble	2014-12-20	2014-12-23	\$115.00
1460	209	12	Barry Staines	2014-12-30	2014-01-02	\$410.00
1459	210	16	Fred Smith	2014-12-20	2014-12-23	\$125.00
1458	211	16	Barry Staines	2014-12-30	2014-01-02	\$440.00
1462	212	7	Grazyna Szadkowski	2014-12-27	2014-12-28	\$170.00
1463	213	9	Daniel Curran	2014-12-29	2014-01-01	\$222.00
1464	214	16	Sue Brandon	2014-12-11	2014-12-15	\$105.00
1465	215	5	Grazyna Szadkowski	2014-12-27	2014-12-15	\$170.00

tbBookingDetails (Detail_ID)

Room_ID	RoomType
1	Std Double or Twin
2	Std Double or Twin + R/A
3	Std Double Double
4	Std Twin SM
5	King Park View
6	Queen with Spa
7	Queen with Shower Ensuite
8	Twin with Shower Ensuite
9	Standard Studio Fri/Sat
10	Standard Studio
11	Courtyard Studio
12	Courtyard Studio Fri/Sat
13	One Bedroom
14	One Bedroom Fri/Sat
15	Ocean View Studio
16	Ocean View Studio Fri/Sat

tbRoomTypes (Room_ID)

Write SQL queries or commands to answer the following.

- What is the highest room rate that was booked?
- How many times has Barry Staines made a reservation?
- What is the name of the operator that booked the most confirmations?
- Who are the guests that booked the "Ocean View Studio" room for the Friday/Saturday?
- Of the guests that booked the "Ocean View Studio" room for the Friday/Saturday period, who paid the lowest room rate?

Question 5

(20 marks)

Answer all questions - Each question is worth 5 marks

1. What is data redundancy?
2. When is a table in 3NF?
3. What is a business rule, and what is its purpose in data modeling?
4. A lock is used in concurrency control. Describe what a lock is, and how, in general, does it work?

