



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
(TAKE HOME)
SEMESTER II
SESSION 2020/2021**

COURSE NAME : DATA MANAGEMENT AND APPLICATIONS

COURSE CODE : MET10304

PROGRAMME : MET

EXAMINATION DATE : JULY 2021

DURATION : 3 HOURS

INSTRUCTION : ANSWER ALL QUESTIONS
OPEN BOOK EXAMINATION

THIS QUESTION PAPER CONSISTS OF SIX (6) PAGES

Q1 Consider ABC Credit Service are small loans, which is beginning to gain popularity especially among borrowers in developing countries. The idea is to bring venture lenders together using information technology. Typically, the loans will be used to finance startup or development of the borrower's company, so that there is a realistic chance for repayment. The money in a loan can, unlike traditional loans, come from many lenders. In this problem, you must create an E-R model that describes the information necessary to manage micro loans. The following information form the basis for creating the model:

- i. Each borrower and lender must be registered with information about name and address.
- ii. A loan starts with a loan request, which contains information about when the loan should at latest be granted. The total amount being discussed (US-dollars), and how long the payback period is. Also, a description is included of how the money will be used. The rent on the payment is calculated in the loan amount, which is to say, the full amount is not paid.
- iii. Lenders can commit to an optional portion of the total amount of a loan request.
- iv. When the commitments for the loan request covers the requested amount, the request is converted to a loan. If not enough commitments can be reached, the loan request is cancelled. A borrower can have more than one request, and more than one loan at a time, but can at most make one request per day.
- v. The loan is paid through an "intermediary", typically a local department of a charity, who has a name and an address.
- vi. The borrower chooses when he or she will make a payment. Every payment must be registered in the database with an amount and a date (at most one payment per loan per day). The lenders share the repayment based on how large a part of the loan they are responsible for.
- vii. If the loan is not repaid before the agreed upon deadline, a new date is agreed. The database must not delete the old deadline, but save the history (the deadline can be overridden multiple times).
- viii. Each lender can for each burrower save a "trust", which is a number between 0 and 100 that determines the lender's evaluation of the risk of lending money to that person. The number must only be saved for the borrowers, for whom there has been made such an evaluation.

(a) Create an E-R model for the data described above. If you make any assumptions about data that doesn't show from the problem, they must be described.

(13 marks)

(b) Make a relational data model from **Q1(a)**.

(12 marks)

Q2 The following relation schema can be used to register information on the repayments on ABC Credit Service (see the text in the problem 1 for the explanation on ABC Credit Service, and the example on data about ABC Credit Service in 1(b)).

Repayment(borrower_id, name, address, loanamount, requestdate, repayment_date, request_amount)

A borrower is identified with an unique borrower_id, and has only one address. Borrowers can have multiple simultaneous loans, but they always have different request dates. The borrower can make multiple repayments on the same day, but not more than one repayment per loan per day.

- (a) State a key (candidate key) for Repayment (5 marks)
- (b) Perform the normalization to Boyce-Codd Normal Form. State for every step in the normalization, which functional dependency that causes it (20 marks)

Q3 (a) Based on the **Figure 1(a)**:

- (i) Produce the result obtained from the query below?

```
SELECT * FROM runners WHERE id NOT IN (SELECT winner_id
FROM races)
```

(2 marks)

- (ii) Explain your answer in **Q3(a)(i)** and also produce an alternative version of this query that will avoid the issue that it exposes. (5 marks)

(b) Surprisingly, given the sample data provided, the result of this query will be an empty set.

- (i) Given two **Table Q3(b)(i)** and **Q3(b)(ii)**. Produce the result obtained from the given tables. (5 marks)

- (ii) Explain your answer in **Q3(b)(i)**. (3 marks)

(c) Explain what are the five V's of Big Data and briefly explain with example on the V's. (10 marks)

- Q4** (a) (i) Explain why the DBMS expert said the relational data model is dying?
(4 marks)
- (ii) Critique five (5) common problems in IoT Data Management.
(6 marks)
- (b) The recent IoT boom introduced the world to IoT in the form of connected thermostats, automobiles, factory robots, and pretty much everything we touch these days. Coupled with the need to process data as close to the device as possible, IoT naturally led to the birth of computing at the "edge" of a larger and more comprehensive system. Examine this edge computing idea by giving the real example and its core pattern for it can be done.
(8 marks)
- (c) Support the best practices framework for managing data assets with its goals, benefits, roles and tools.
(7 marks)

- **END OF QUESTIONS** -

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```

sql> SELECT * FROM runners;
+----+-----+
| id | name      |
+----+-----+
|  1 | John Doe  |
|  2 | Jane Doe  |
|  3 | Alice Jones |
|  4 | Bobby Louis |
|  5 | Lisa Romero |
+----+-----+

sql> SELECT * FROM races;
+----+-----+-----+
| id | event          | winner_id |
+----+-----+-----+
|  1 | 100 meter dash | 2         |
|  2 | 500 meter dash | 3         |
|  3 | cross-country  | 2         |
|  4 | triathlon      | NULL      |
+----+-----+-----+
    
```

Figure 1(a): SQL Table

Table Q3(b)(i)

```

CREATE TABLE dbo.envelope(id int, user_id int);
CREATE TABLE dbo.docs(idnum int, pageseq int, doctext varchar(100));

INSERT INTO dbo.envelope VALUES
    (1,1),
    (2,2),
    (3,3);

INSERT INTO dbo.docs(idnum,pageseq) VALUES
    (1,5),
    (2,6),
    (null,0);
    
```

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Table Q3(b)(ii)

```
UPDATE docs SET doctext=pageseq FROM docs INNER JOIN envelope ON envelope.id=docs.idnum
WHERE EXISTS (
  SELECT 1 FROM dbo.docs
  WHERE id=envelope.id
);
```