UTHM
Universiti Tun Hussein Onn Malaysia

UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2021/2022

COURSE NAME : DATABASE

COURSE CODE : DAT 20103

PROGRAMME CODE : DAT

EXAMINATION DATE : JANUARY / FEBRUARY 2022

DURATION : 3 HOURS

INSTRUCTIONS : 1. ANSWER **ALL** QUESTIONS.

2. THIS FINAL EXAMINATION IS AN **ONLINE** ASSESSMENT AND CONDUCTED VIA **OPEN BOOK**.

THIS QUESTION PAPER CONSISTS OF **SEVEN (7)** PAGES

TERBUKA

Q1   Define the meaning of the Database Management System (DBMS).

(1 mark)

Q2   List **TWO (2)** advantages of using database over the traditional file-based systems.

(2 marks)

Q3   State **THREE (3)** types of software in a database system.

(3 marks)

Q4   Distinguish between the centralised and the distributed database system.

(2 marks)

Q5   Explain why the development of a database system follows the Database Life Cycle (DBLC) instead of the Systems Development Life Cycle (SDLC).

(2 marks)

Q6   Differentiate between the **TWO (2)** types of data independence provided by the three-level ANSI-SPARC architecture.

(4 marks)

Q7   The following are the attributes for a PASSENGER entity.

id, title, first_name, last_name, date_of_birth, age, nationality, passport, home_address, office_address, phone

Identify the:

(a)   composite attributes

(2 marks)

(b)   derived attribute

(1 mark)

(c)   multi-valued attribute

(1 mark)

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Q8   The following are two relations with the same structure.

Table Q8 (a): Staff1

staff_no	name	department
0021	Jamil	Electrical Engineering
0034	Harun	Electrical Engineering
0027	Jee Cheng	Information Technology
0039	Fatimah	Civil Engineering
0098	Rafeah	Landscaping

Table Q8 (b): Staff2

staff_no	name	department
0021	Jamil	Electrical Engineering
0038	Elillarasu	Civil Engineering
0027	Jee Cheng	Information Technology
0039	Fatimah	Civil Engineering
0100	Halimah	Electrical Engineering

Construct the result table from the execution of the following SQL statement.

```
(SELECT staff_no, name, department
 FROM Staff1)
 INTERSECT
(SELECT staff_no, name, department
 FROM Staff2);
```

(4 marks)

Q9   **Figure Q9** shows the superclass-subclass entities in an organization's database.
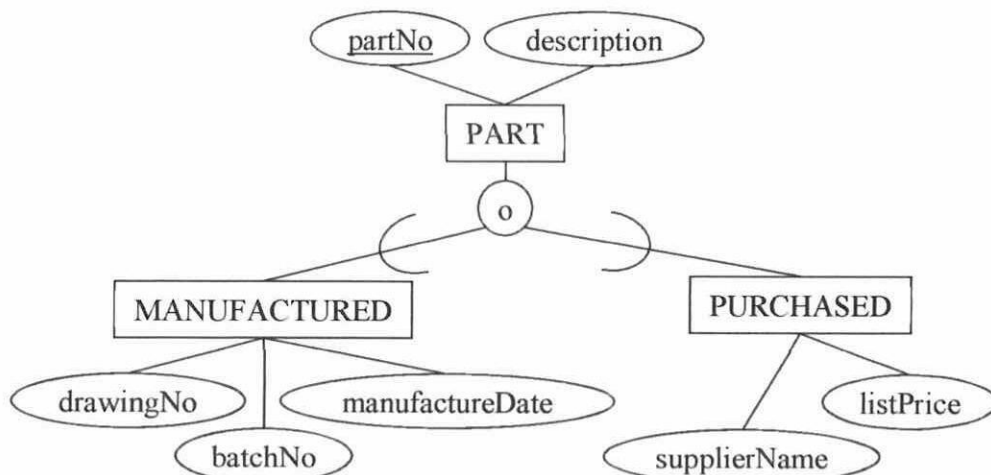

Figure Q9

Translate these entities into relational schemas.

(6 marks)

Q10 The following is the work process of a bank.

> *Bank Kijang is an investment bank that invests heavily in the construction and transportation sectors. It has multiple branches across Malaysia and wishes to build a new staff management system in preparation for their expansion to other Asia-Pacific countries.*

> *Each of the bank's branch has a unique branch number and a branch name. A branch has many staff, and a staff works at only one branch. Each staff has a unique staff number which was assigned to them upon joining the bank. The bank records the staff's name, address and phone number. The address consists of the house number, street, postcode and country. Some staff have multiple phone numbers, and a phone number belongs to only one staff.*

> *A staff performs more than one task, and each task can be performed by many staff. Information about the task code, task category and task details, are kept for each task. A staff is either a permanent staff or a contract staff. Contract staff are hired for a specific service duration. Their service duration and pay rate are recorded by the bank. The bank also records the basic salary and allowance of all permanent staff.*

> *Each staff can support many dependents (close family members), and each dependent is supported by only one staff. Each dependent is assigned a dependent number, and the bank records the dependent's name, date of birth and relationship to staff.*

Illustrate an entity relationship diagram (ERD), complete with all the necessary entities, relationships, attributes, primary and foreign keys, cardinalities, and other relevant elements.

(28 marks)

Q11 The following table shows the customer ordering data from an e-commerce company.

Table Q11: CustomerProductOrder

o_id	o_date	c_id	c_name	p_id	p_price	qty
2101	18/11/2021	MY1001	Ruben	A107	800	2
				C105	325	1
2102	19/11/2021	SG1007	Ehsan	B111	500	4
				C105	325	3

The abbreviations used in the table have the following meaning.
o_id = order ID
o_date = order date
c_id = customer ID
c_name = customer name
p_id = product ID
p_price = product unit price
qty = quantity ordered

(a) Convert **Table Q11** into the First Normal Form (1NF).

(6 marks)

(b) **Figure Q11 (b)** shows the dependency diagram for **Table Q11**.
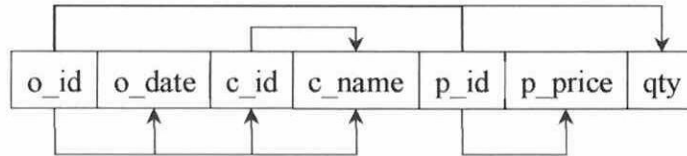

| o_id | o_date | c_id | c_name | p_id | p_price | qty |

Figure Q11 (b)

(i) Convert your answer in **Q11 (a)** into the Second Normal Form (2NF).

(9 marks)

(ii) Convert your answer in **Q11 (b) (i)** into the Third Normal Form (3NF).

(12 marks)

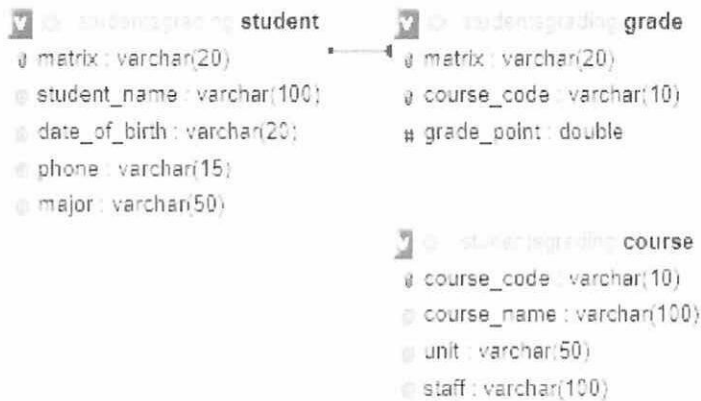**Q12** **Figure Q12** shows the database design of the Students' Grading System.

student
- matrix : varchar(20)
- student_name : varchar(100)
- date_of_birth : varchar(20)
- phone : varchar(15)
- major : varchar(50)

grade
- matrix : varchar(20)
- course_code : varchar(10)
- grade_point : double

course
- course_code : varchar(10)
- course_name : varchar(100)
- unit : varchar(50)
- staff : varchar(100)

Figure Q12

Each student must choose a major, either Software Engineering, Bioinformatics, Computer Graphics or Data Engineering programme. Students may register more than one course in a semester and will receive only one grade for each course registered.

(a) Produce an SQL statement that displays the students' information and the number of courses they registered based on the records in the grade table. The statement should produce an output as follows:

Table Q12 (a)

matrix	student_name	CoursesCount
AC1007	Khor Yong Jian	6
AC1001	Iqram bin Khalid	5
AC1012	Elillarasu a/l Rames	4

(2 marks)

(b) Produce an SQL statement that displays the student's information and the grade point, for the student receiving the highest grade point for course code 'SCS001'. The statement should produce an output as follows:

Table Q12 (b)

matrix	student_name	course_code	grade_point
AC1007	Khor Yong Jian	SCS001	3.50

(4 marks)

(c) Produce an SQL statement that lists the students' information, the sum of grade point and the average of grade point, for each student. The statement should produce an output as follows:

Table Q12 (c)

matrix	student_name	SumGradePoint	AvgGradePoint
AC1007	Khor Yong Jian	20.10	3.35
AC1001	Iqram bin Khalid	16.45	3.29
AC1012	Elillarasu a/l Rames	13.16	3.29

(3 marks)

(d) Produce an SQL statement that displays a list of students which have filled out their phone number. Sort the list according to the students' name in ascending order. The statement should produce an output as follows:

Table Q12 (d)

matrix	student_name	phone
AC1001	Iqram bin Khalid	019-876 5432
AC1007	Khor Yong Jian	011-234 5678

(2 marks)

(e) Produce an SQL statement that lists the students' information and the average grade point, for students receiving an average grade point of more than 3.50. The statement should produce an output as follows:

Table Q12 (e)

matrix	student_name	AvgGradePoint
AC1010	Akma binti Mustaffa	3.51

(3 marks)

(f) Produce an SQL statement that lists the students' information, course code, course name and grade point, for students with a grade point between 3.40 and 3.50. The statement should produce an output as follows:

Table Q12 (f)

student_name	phone	course_code	course_name	grade_point
Khor Yong Jian	011-234 5678	SCS002	Data Structure	3.47
Iqram bin Khalid	019-876 5432	SCS003	Computer Graphics Programming	3.48

(4 marks)

– END OF QUESTIONS –

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