UNIVERSITI
TEKNOLOGI
PETRONAS

FINAL EXAMINATION
MAY 2024 SEMESTER

COURSE	:	**TFB1023 - DATABASE SYSTEMS**
DATE	:	**5 AUGUST 2024 (MONDAY)**
TIME	:	**9:00 AM - 12:00 NOON (3 HOURS)**

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in the Answer Booklet.
2. Begin **EACH** answer on a new page in the Answer Booklet.
3. Indicate clearly answers that are cancelled, if any.
4. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.
5. **DO NOT** open this Question Booklet until instructed.

Note :

i. There are **TEN (10)** pages in this Question Booklet including the cover page

ii. **DOUBLE-SIDED** Question Booklet.

1. a. Define Database Management System (DBMS).

[2 marks]

b. Differentiate between Entity Integrity and Referential Integrity and provide **ONE (1)** example for each.

[4 marks]

c. Explain **THREE (3)** functions of DBMS that would guarantee the integrity and consistency of stored data in database.

[6 marks]

d. Susan plans for a holiday trip. She opens the websites, and she buys airline tickets and hotel reservations online.

From transaction above, list **TWO (2)** examples of data and information that would be stored by the website.

[4 marks]

e. Analyze **TWO (2)** issues with File System Data Processing.

[4 marks]

2. The Jaybee Group (JBG) is an agency that provides employment positions for prospective employers. For this reason, the agency needs to store information such as name, identification number, age, street and postcode address, phone number and the skill types to allow the candidate to apply for the job. Each candidate can list up to four types of expertise when applying for the job. Besides that, the agency also needs to store the employer-related record in a database. The request for employees is submitted by the employer to the JBG agency by stating the job title, salary offered and data of employment. The JBG agency will then search for the number of qualified candidates to be selected for the interview session.

   Based on the given scenario, answer the following questions:

   a. Describe **ONE (1)** example for each of the composite, multivalued and derived attributes in the scenario.

   [6 marks]

   b. Explain any **TWO (2)** identified mandatory relationship in the scenario.

   [4 marks]

   c. Design a complete logical Entity Relationship Diagram (ERD) for JBG Agency Database.

   [**Note:** Use Unified Modeling Language (UML) class diagram and crow's foot notation].

   [10 marks]

3. a. **FIGURE Q3** depicts a conceptual model for PropertyCo system database. Assume a client can book many properties, while a property belongs to one client. A property contains many buildings, and buildings belong to many properties. Redraw the conceptual model in **FIGURE Q3** to a relational database logical model. Identify the primary key and foreign key in the design.

[8 marks]

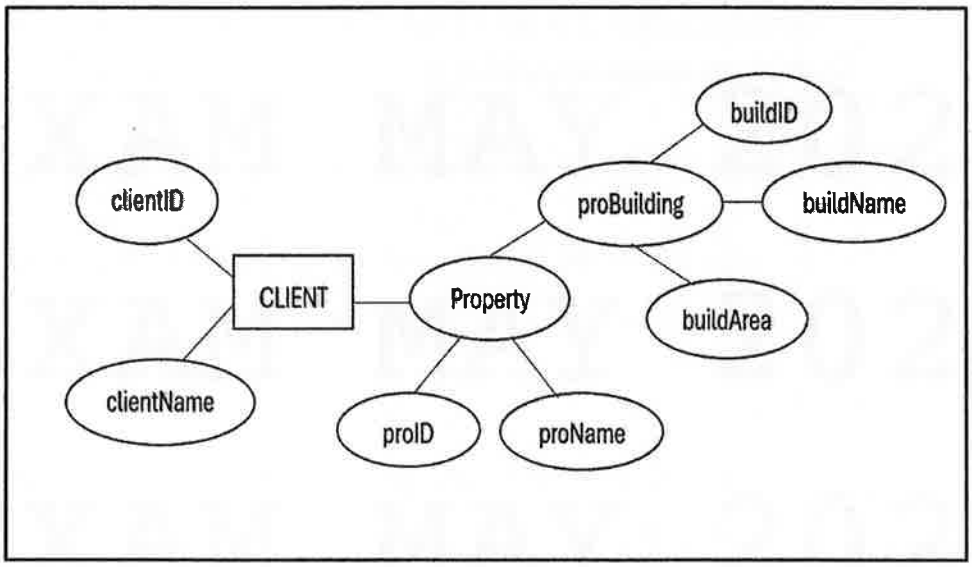

FIGURE Q3: Conceptual Model for PropertyCo System Database

b. Tables below show a database construct for M2M Sdn Bhd that stores data to track all charges to the projects. The charges are based on the hours each employee works on the project.

TABLE Q3a: Partial Records of Job Relation

JobCode	JobDescription	JobChgHour
500	System Analyst	96.75
501	Mechanical Engineer	67.90
502	Clerical Support	26.87
503	Applications Designer	48.10
504	Database Engineer	125.00

TABLE Q3b: Partial Records of Project Relation

ProjNo	ProjName	ProjValue	EmpNo
15	Evergreen	145 500.0	103
18	Amber Wave	35 000.0	104
22	Rolling Tide	80 500.0	102
25	Starflight	260 000.0	101

TABLE Q3c: Partial Records of Employee Relation

EmpNo	EmpName	EmpHireDate	JobCode	EmpYears
101	John	08-Nov-10	500	10
102	David	12-Jul-89	504	23
103	June	01-Dec-96	503	13
104	Alice	22-Aug-91	502	16
105	William	18-Jul-97	501	12
106	Maria	22-Jun-14	503	8

TABLE Q3d: Partial Records of Assignment Relation

AsgnNo	AsgnDate	ProjNo	EmpNo	JobCode	AsgnHours
1001	12-Mar-16	15	103	503	3.5
1002	22-Mar-16	15	106	503	4.2
1003	22-Mar-16	22	102	504	2.0
1004	23-Mar-16	25	101	500	3.8
1005	12-Mar-16	18	104	502	5.6

i. Write a SQL statement to retrieve the number of projects with the value between $50,000.00 and $100,000.00.

[4 marks]

ii. Write a SQL statement to calculate the payment receive for all employees according to their job assignment (label column as Payment). Display your answer to show the employee's name, job description, assignment date and Payment.

[4 marks]

iii. Write a SQL statement to display the employee's name, job description and day of the week on which the employee has been employed (label as Day).

[4 marks]

4. **TABLE Q4** shows sample data of books in the library. The data reflects that a book can be retrieved from several online sources.

TABLE Q4: Sample Data of Books in Library

Attribute Name	Sample Value	Sample Value	Sample Value	Sample Value
bookID	121	332	434	516
bookName	Introduction to Programming Concepts	Psychology in Science Education	Discrete Mathematics and Technology	Advanced System and Engineering
shelfCode	ABB-12	BVV-98	ACC-43	ADD-33
shelfDept	Information Technology	Psychology	Science	Engineering
edition	2020	2019	2015	2022
sourcePublisher	IEEE, Springer, ADV	APPL, Springer	IEEE, DEV	TRAF, Springer, IEEE, DEV

Based on the **TABLE Q4**, answer the following questions:

a. Identify the purpose of normalization.

[2 marks]

b. Explain **TWO (2)** types of update anomalies that might occur if **TABLE Q4** is left unnormalized.

[4 marks]

c. Analyze whether the relation in **TABLE Q4** is in a First Normal Form (1NF) or not. Explain your answer.

[3 marks]

d. Based on the sample data shown, draw the dependency diagram to represent all the dependencies in the relation.

[5 marks]

e. Write the relational schema that meets Third Normal Form (3NF) requirements. Label the primary key and foreign key in each relation and create new entities and attributes as necessary.

[6 marks]

5. The tables below show a stored relational database of Customer Order-related data for Y2U Company.

TABLE Q5a: Customer Table

CustID	CustName	CustCity	CustEmail	OrderID
101	Nur Maya	Milan	nurmaya@y2u.com	S122
102	Mohd Ali	Venice	mohdali@y2u.com	C909
103	Nur Alia	Berlin	nuralia@y2u.com	SH876
104	Albert Yong	Munich	albertyong@y2u.com	SH878
105	Ravinder Kumar	Frankfurt		

TABLE Q5b: Order Table

OrderID	OrderDate	PurchasedAmount	CustID
S122	10-07-2024	58.10	101
C909	12-12-2023	189.90	102
SH876	08-10-2020	455.00	103
SH878	01-02-2024	89.90	104

TABLE Q5c: Product Table

ProdID	ProdDescription	OrderID
P101	Stationary Kids Set	S122
P102	Men Denim Jacket	C909
P103	Women Adults Pink	SH876
P104	Men Adults Black	SH878

Write SQL queries for the database to do the following:

a. Create Customer table. Include primary key and foreign key constraints at the table level.

[5 marks]

b. Add Ravinder Kumar's email address and order ID into the Customer table as detailed below.
[Email: ravinderkumar@y2u.com, Order ID: HT900]

[3 marks]

c. Display detail of orders in ascending order using Order ID.

[3 marks]

d. Calculate the total purchased amount for all orders, and store in column named as totalAmount.

[4 marks]

e. Find the name and city of the customer whose placed order before the year 2024. Sort the results according to name.

[5 marks]

-END OF PAPER-