UNIVERSITI TEKNOLOGI MALAYSIA

MID SEMESTER EXAM

SEMESTER 1, 2023/2024

COURSE CODE	:	**SECD2523**
COURSE NAME	:	**DATABASE**
YEAR (PROGRAM)	:	**2 (SECB, SECR, SECJ, SECV)**
DATE	:	**22 NOVEMBER 2023**
TIME	:	**8.00 PM – 10.00 PM**
VENUE	:	**P19 (BK4 & BK5)**

INTRODUCTIONS TO STUDENTS:

i. Fill in your particulars in the question and answer booklet.

NAME :	
MATRIC NO. :	
SECTION :	
LECTURER NAME :	

ii. Answer **ALL** questions in the given **ANSWER BOOKLET**.
iii. This paper consists of **THREE SECTIONS:**
Section A: 25 MCQs
Section B: 4 Structured Questions
Section C: 1 Case Study Question
iv. Submit **BOTH Questions and Answer Booklet** at the end of the exam.

SECTION A

OBJECTIVE QUESTIONS (25 MARKS)

INSTRUCTION:

This section consists of **TWENTY FIVE (25)** questions. Answer **ALL** questions in the answer booklet.

1. What is the main limitation of the file-based approach when it comes to data management?

   A. It provides strong data security

   B. It allows for easy data sharing

   C. It results in data redundancy and inconsistency

   D. It is highly efficient in data retrieval

2. Choose one of the following major components in DBMS environment that provide instructions and rules of a databases?

   A. Software

   B. Data

   C. Procedure

   D. People

3. *"A library contains a collection of books of different genres"*
   Which of the following is can describe the statement above,?

   A. books = file; library = data

   B. library = database; books = data

   C. books = database; genres = data

   D. library = file; genres = programs

4. A _____ is the set of allowable values for one or more attributes.

   A. Cardinality

   B. Tuple

   C. Degree

   D. Domain

5. Which one is the **CORRECT** relation instance for the following relation?

Employee

EmpID	EmpName	Address	PhoneNo	DeptID
586	Azira Ali	Jalan Teratai	51727868	D100
587	Nurzila	Kampung Semerah	31231333	D101
588	John Will	Lorong Kanan	80956002	D101

A. (587, Nurzila, Kampung Semerah, 31231333, D101)

B. Employee (EmpID, EmpName, Address, PhoneNo, DeptID)

C. (EmpID, EmpName, Address, PhoneNo, DeptID)

D. (Jalan Teratai, Kampung Semerah, Lorong Kanan)

6. What is the meaning of Candidate Key?

A. An attribute, or a set of attributes, that uniquely identifies a tuple within a relation.

B. A super key such that no proper subset is a super key within the relation.

C. When a key consists of more than one attribute.

D. An attribute, or set of attributes, within one relation that matches the primary key of some relation.

7. Which one of the following is the **CORRECT** sequence of the Database Application Lifecycle?

A. Planning → Requirement Analysis → System Definition → Database Design → Implementation → Testing → Maintenance

B. Planning → Requirement Analysis → System Definition → Database Design → Implementation → Maintenance → Testing

C. Planning → System Definition → Requirement Analysis → Database Design → Implementation → Maintenance → Testing

D. Planning → System Definition → Requirement Analysis → Database Design → Implementation → Testing → Maintenance

8. Why testing phase is important in the Database Application Lifecycle?

   A. To properly plan the flow of the database design.

   B. To identify any issues or bugs, so it can be fixed before the product is delivered.

   C. To collect the requirements and necessary data from the stakeholders.

   D. To implement the database that has been designed in Entity Relationship Diagram (ERD).

9. Assume that there is no StaffID as a primary key in the following relation, determine the possible composite key that can be used in order to get a unique tuple of data.

Staff

StaffID	StaffName	Role	BranchID
S001	Siti Aishah	Manager	B1
S002	Zakiah Ali	Salesperson	B1
S003	Siti Aishah	Salesperson	B2
S004	Putri Batrisya	Manager	B2

   I. (StaffName, Role)
   II. (StaffName, BranchID)
   III. (BranchID)
   IV. (Role, BranchID)

   A. All of the above

   B. I, II, III

   C. II, III, IV

   D. I, II, IV

10. The following examples are relational database schema for a company which consists of Employee, Branch and Product:

Employee (EmpNo, EmpName, Position, BranchName)
Branch (BranchID, BranchName, Address, PhoneNo)
Product (ProductID, ProductName, EmpNo, BranchID)

Identify the relational key for attributes BranchID and EmpNo from the Product relation.

A. Candidate key

B. Primary key

C. Foreign key

D. Alternate key

11. After mission statements and objectives have been identified, Amran divides the scope, boundaries and view based on the particular job role in developing a Human Resource Management System. What is the current phase that Amran works on?

    A. Planning

    B. System definition

    C. Requirement analysis

    D. Alternate key

12. Hakim just moved to a database team in Company X. The leader of that team asked him to prepare a document that has the detailed information about the contents of a database, common vocabulary, such as the names of measured variables, their data types or formats, and text descriptions. In this situation, what is the document that needs to be prepared by Hakim?

    A. Attributes

    B. Data dictionary

    C. Entity relationship diagram

    D. User transaction

13. What is an attribute in the context of the Entity Relationship Model?

    A. A database system.

    B. A relationship.

    C. A connection.

    D. A property of a class

14. The attribute name could be structured as an attribute consisting of first name, middle name and last name. This type of attribute can be called as _____.

    A. Simple attribute.

    B. Composite attribute

    C. Multivalued attribute.

    D. Derived attribute.

15. Analyze the following entity relationship diagram (ERD). Determine all possible business rules from the diagram in Figure 1.

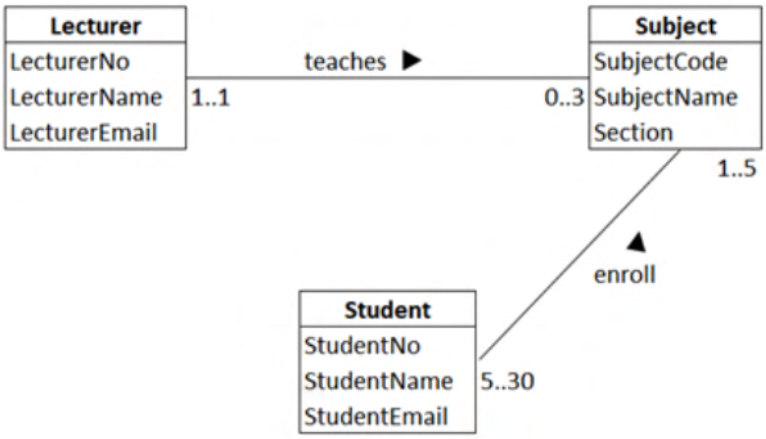

Figure 1

I. A lecturer can teach from 0 up to 3 subjects.
II. Each class must be taught by more than one lecturer.
III. A class must have a minimum of 5 students and a maximum of 30 students.
IV. A student can enroll to a minimum of 1 class and a maximum of 5 classes.

A. I, II, and III

B. I, II and IV

C. I, III and IV

D. II, III and IV

16. All faculties operate four departments in their organization. This relationship represents a _____.

A. one-to-one relationship

B. one-to-many relationship.

C. many-to-one relationship.

D. many-to-many relationship.

17. The _____ constraint must be included to remove duplicate rows from the result of an SQL Statement.

A. ONLY

B. UNIQUE

C. DISTINCT

D. SINGLE

18. Choose the correct SQL statement to update the firstname = Aminah to Aliya from a table named *employee.*

    A. UPDATE RECORD employee SET Fname = ‘Aliya’ WHERE LName = ‘Aminah’;
    B. UPDATE RECORD employee SET INTO Fname = ‘Aliya’ WHERE LName = ‘Aminah’;
    C. UPDATE employee SET FName = ‘Aliya’ WHERE LName = ‘Aminah’;
    D. UPDATE employee SET INTO Fname = ‘Aliya’ WHERE LName = ‘Aminah’;

19. Select a suitable language that allows users to specify the data types and structures and constraints on the data to be stored in the database.

    A. Data definition language
    B. Data manipulation language
    C. Structured query language
    D. Data control language

20. Raju accidently deleted all rows in a table after he executed the following query:

    DELETE FROM departments;

    Initially, he planned to delete a few rows for the Purchasing department only. What is correct statement to perform the task?

    A. Remove FROM, should be DELETE departments;
    B. Should add WHERE = 'Purchasing';
    C. The query should be DELETE * FROM Purchasing;
    D. Should add WHERE department_name = 'Purchasing';

21. Which SQL command is used to delete records into a database table?

    A. SELECT
    B. UPDATE
    C. INSERT
    D. DELETE

22. What happens if WHERE clause is omitted from a DELETE statement?

A. First record of the relation will be deleted.

B. All records from the relation will be deleted.

C. No record from the relation will be deleted.

D. The statement will not be executed and will give a syntax error.

23. A staff already created a table named Staff with the following attributes but he forgot to indicate that the StaffID attribute will be a primary key. What is the query that needs to be executed to solve this issue?

StaffID	StaffName	Role	BranchID

A. ALTER TABLE Staff ADD CONSTRAINT pk_sid PRIMARY KEY (StaffID);

B. ALTER TABLE Staff ADD CONSTRAINT pk_sid PRIMARY KEY (StaffID, BranchID);

C. ALTER TABLE Staff PRIMARY KEY (StaffID);

D. ALTER TABLE Staff PRIMARY KEY (StaffID, BranchID);

24. Muna writes the following query for inserting data into a table. However, the query got an error and cannot be executed. Identify the error in this query

INSERT INTO (department_id, department_name, manager_id, location_id) VALUES (70, 'Public Relations', 100, 1700);

A. INSERT INTO is written in capital letters.

B. Wrong spelling for VALUES – should be VALUE.

C. Parentheses for attributes.

D. No table name after INSERT INTO.

25. Which INSERT statement is **CORRECT** to insert a new row into table of members that consist of members ID, first name and last name?

A. INSERT INTO members (members_id) VALUES (1002, Abu);

B. INSERT INTO members (Fname, Lname) VALUES ('Abu', 'Bakar');

C. INSERT INTO members VALUES (NULL, 'Abu', 'Bakar');

D. INSERT INTO members (Fname, Lname, members_id) VALUES (1002, 'Abu', 'Bakar');

SECTION B

STRUCTURED QUESTIONS (50 MARKS)

INSTRUCTION:

This section consists of **FOUR (4)** questions. Answer **ALL** questions in the answer booklet.

QUESTION 1 **[15 MARKS]**

a) ABC Company, a small business, currently manages its data using a traditional file-based approach. As the business expands, they are encountering challenges related to data integrity, scalability, and efficiency. The management team is considering transitioning to a database system to address these issues and has enlisted your expertise as a consultant to help them make an informed decision.

i. Describe **TWO** advantages of a database approach for managing data, particularly in the context of a growing business. **(2 Marks)**

ii. Give **ONE** example of DBMS that small business owners can consider to use **(1 Mark)**

iii. Describe **TWO** responsibilities of a Database Administrator that is involved in the implementation and management of a database system. **(2 Marks)**

b) JDT Football Club, a professional football team, is seeking to enhance its data management capabilities by implementing a Football Team Management System. The system will centralize information related to players, teams and merchandise. A team can have multiple players, but each player belongs to only one team. Merchandise is associated with a specific team. A team can have multiple merchandise items. As a database designer, you are tasked to design databases and associated tables for this system. To manage this data, you need to define the database schema and ensure referential integrity.

Team

TeamID	TeamName	CoachName	FoundedYear	HomeStadium
1	JDT 1	Esteban Solari	1972	Johor Bahru
2	JDT 2	Mariano Echeverría	1955	Pasir Gudang

Player

PlayerID	First Name	Last Name	Position	DateOfBirth	Nationality	TeamID
19	Akhyar	Rashid	FW	1-05-1999	Malaysian	1
9	Bergson	Da Silva	FW	9-02-1991	Brazilian	1
1	Riezman	Mustafah	GK	26-09-2001	Malaysia	2

Merchandise

ProductID	ProductName	Category	TeamID	Price	StockQuantity
201	JDT 1 Home Jersey	Apparel	1	40.00	100
202	JDT 2 Scarf	Accessories	2	15.00	50
203	JDT 1 Mug	Accessories	1	10.00	75

i. From the case study, explain the concept of referential integrity in a relational database. **(2 Marks)**

ii. Identify the primary keys and foreign keys (if any) for each table. **(3 Marks)**

iii. Identify **TWO** relationships that may exist between the entities based on the case study. **(5 Marks)**

Entity 1	Multiplicity	Relationship	Entity 2	Multiplicity

QUESTION 2 **[10 MARKS]**

A small online e-commerce store is looking to create a database to manage its product inventory, customer information, orders, and reviews. They want to improve their online shopping experience and streamline their business operations.

The main requirements for the system are:

Products	● Each product should have a unique Product ID. ● A database that will store the product name, description, price, and available quantity. ● The Warehouse Supervisor is in charge of the product and will categorize products into different product categories (e.g., electronics, clothing, books).
Customers	● Each customer should have a unique Customer ID and they would be able to access their information from the system. ● A database that will store customer information, including name, address, email, and phone number. ● The Store Manager will keep track of the customer's order history.
Orders	● Keep a record of all customer orders, including the order number, order date, and total cost. ● The Store Manager will associate orders with the customer who placed them. ● Include the list of products (with quantities) in each order.
Reviews	● Allow Customers to leave reviews for products. ● Each review should include a rating, a comment, and the date it was posted. ● The Store Manager will associate reviews with the product being reviewed.

a) As a project manager, you are responsible for planning and designing the database systems. In your planning, you proposed to use the **view integration approach** in the requirement collections and analysis. Using a diagram, explain the approach based on the case study. **(5 Marks)**

b) You were asked to propose the database design methodology. For each of the database design phases, discuss the process involved (for example as in Logical and Physical Database design). **(5 Marks)**

Database Design Phases	Process
Conceptual database design **[5 marks]**	
Logical database design	1. Do normalization for all entities created from conceptual database design. 2. Update the data dictionary based on the logical database design.
Physical database design	1. Estimating the amount of products, orders, reviews and customer's information that the database will need to store. 2. Estimating the size of the data. 3. Estimating the size of order records (transaction logs) based on the frequency of the transactions. 4. Choose the DBMS based on the budget from the proposal. 5. Design the index (data structure and query) based on the DBMS schemas.

QUESTION 3 **[12.5 MARKS]**

a) Draw all business rules as listed in Figure 3, in a single conceptual Entity Relationship Diagram (ERD). Use proper UML notation and write all the multiplicities. **(8 Marks)**

R1:	A book is written by an author. One author can write many books.
R2:	A customer can make one or more purchases. Each purchase involves only one customer.
R3:	A book can be involved in zero or more purchases. Each purchase involves only one book.

Figure 3: Business Rules for ERD

b) Based on the multiplicity values shown in the Conceptual ERD in Figure 4, answer all questions in (i) – (iii).

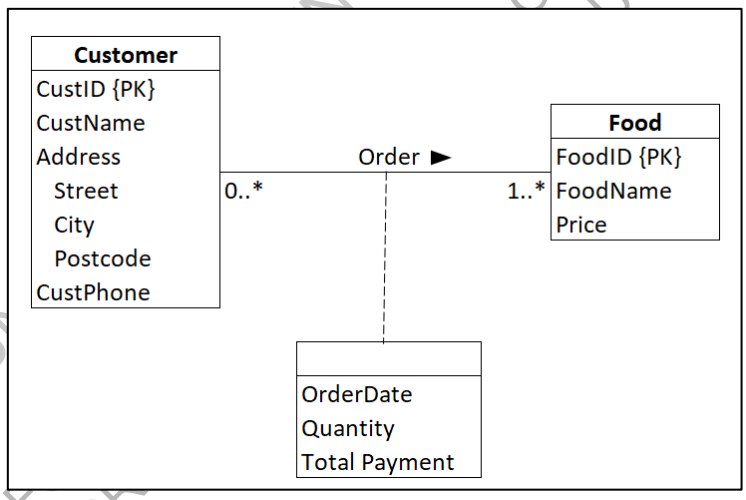

Figure 4: Conceptual ERD

i. What is the cardinality constraint for the **Order** relationship? **(1 Mark)**

ii. Identify the participation constraints for the **Customer** entity and **Food** entity. **(2 Marks)**

iii. Determine the entity type for the **Customer** entity and **Food** entity. **(1.5 Marks)**

QUESTION 4 **[12.5 MARKS]**

a) Explain the business rules for every entity in **EACH** of the relationships (i) – (iii) shown in Figure 5. **(3 Marks)**

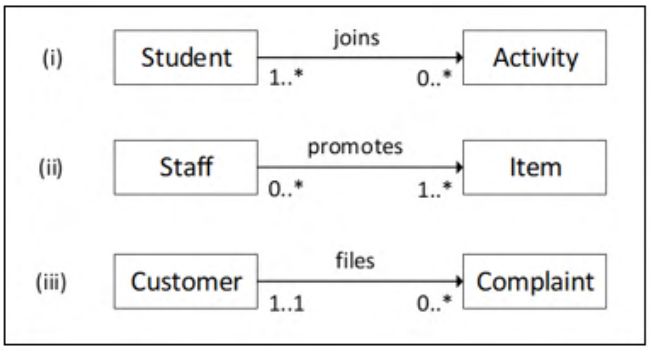

Figure 5

b) Based on the case study in Figure 6, answer questions in (i) and (ii).

The AtoZ Organization is managing employee record. You are *required* to design a *database system for tracking employee information* based on the scenario as described below:

a) The AtoZ Organization made up of various **departments**, each having a name, identifying no., and an employee who is the manager. A department may be located in different places.
b) Information about **employee** includes name, employee number, birth date, address, sex, and salary. Each employee is assign and **refer** to one department. The date the manager is appointed to a department is also tracked. Employees may be directly supervised by another employee.
c) Each **project** within the organization is controlled by a department. Employees (not necessarily from the controlling dept.) are assigned to projects. Information about projects includes project name, no., and location. Hours spent by employees on each project are also kept.

Figure 6: AtoZ Organisation

i. The scenario is summarized in relational schema given below. However, **THREE** errors identified on relational schema. Circle the errors and correct them. Show your corrections by rewrite the corrected relational schema. **(1.5 Marks)**

Department (DeptNo, Name, Location, Hours)
Employee (EmployeeNo, Name, Birthdate, Address, Sex, Salary)
PK (EmployeeNo, DeptNo) refs Project
Project (ProjectNo, ProjectName, Location)

ii. Based on scenario and the corrected relational schema, produce a complete conceptual entity relationship diagram (ER model) using UML notation. **(8 Marks)**

SECTION C

CASE STUDY QUESTIONS (25 MARKS)

INSTRUCTION:

This section consists of **ONE (1)** question only. Answer the question in the answer booklet.

QUESTION 1 **[25 MARKS]**

Case study: Hotel Management System

You have been hired to design a comprehensive database for a hotel management system. The system needs to handle room bookings, guest information, and billing. Your task is to create the database schema and implement various SQL DDL and DML tasks for this hotel.

Database schema:
List of relations:

1. Room relation: A relation to store room information, as below:

ATTRIBUTE	DATA TYPE
roomID (Primary Key)	varchar2(10)
roomNo	number
roomType	varchar2(20)
capacity	number
pricePerNight	number (5,2)
isOccupied	varchar2(5)

2. Guest relation: A relation to manage guest information, as below:

ATTRIBUTE	DATA TYPE
guestID (Primary Key)	varchar2(10)
firstName	varchar2(30)
lastName	varchar2(30)
contactEmail (unique)	varchar2(30)
contactPhone (NOT NULL)	varchar2(12)

3. Booking relation: A relation to guest bookings, as below:

ATTRIBUTE	DATA TYPE
bookingID (Primary Key)	varchar2(10)
guestID (Foreign Key, referencing Guest table)	varchar2(10)
roomID (Foreign Key referencing Room table)	varchar2(10)
checkInDate (NOT NULL)	date
checkOutDate (NOT NULL)	date

a) Write the SQL statement to create the Booking relation with constraints at the **COLUMN LEVEL**. **(4 Marks)**

b) Write the SQL statement to create the Guest relation without constraints. **(2 Marks)**

c) Alter the Guest relation to add the Primary Key constraint. Name the constraint, pk_guest_guestID. **(2 Marks)**

d) Alter the Guest relation to add the remaining constraints, unique and NOT NULL. **(4 Marks)**

e) Change the data type for contactPhone in the Guest relation to integer. **(2 Marks)**

f) Add a new attribute named specialGuest with the data type VARCHAR2(5) to the Guest relation **(2 Marks)**

g) Create a new table named Booking_COPY as a copy from the relation Booking. **(2 Marks)**

h) Rename the Booking_COPY relation to New_Booking. **(1 Mark)**

i) Delete the relation Booking. **(1 Mark)**

j) Restore the relation Booking. **(1 Mark)**

k) Add the data in this table to the Guest relation. **(1 Mark)**

ATTRIBUTE	DATA TYPE
guestID (Primary Key)	G000234
firstName	Mikail
lastName	Mohammad
contactEmail (unique)	mikail@gmail.com
contactPhone (NOT NULL)	0105531234
specialGuest	Yes

l) Update the data in the Guest relation. The first name for guestID G000234 should be updated to Aliuddin. **(2 Marks)**

m) Delete the data in the Guest relation that has the guestID G000234. **(1 Mark)**

- END OF QUESTIONS PAPER-