CONFIDENTIAL

UTM UNIVERSITI TEKNOLOGI MALAYSIA

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MIDTERM TEST
SEMESTER I 2018/2019

COURSE CODE	:	**SCSD2523**
COURSE NAME	:	**DATABASE**
YEAR / PROGRAM	:	**1 / 2 (SCSB/SCSJ/SCSR/SCSV)**
TIME	:	**8:00 P.M. – 10:30 P.M.**
DATE	:	**30 OKTOBER 2018 (TUESDAY)**
PLACE	:	**LECTURE ROOM 1 – 7, N28**

INSTRUCTIONS TO CANDIDATES:

1. Fill in your particulars in the question booklet and answering booklet:

Name	
Passport No.	
Matric No.	
Year / Program	
Lecturer	

2. Read instructions given for each question carefully.

3. Answer **ALL** questions in this question paper.

4. This paper consists of two parts;
   Part A: 10 TRUE/FALSE questions.
   Part B: 4 STRUCTURED ANSWER questions.
   Part C: CASE STUDY question.

THIS PAPER CONSISTS OF 12 (TWELVE) PRINTED PAGES INCLUDING THIS PAGE.

PART A : TRUE/FALSE QUESTIONS 10 MARKS

INSTRUCTION : ANSWER ALL QUESTIONS.
Please write your answer (T/F) in the answer sheets.

1.	Applications are programs that interact directly with the database.	TRUE/FALSE
2.	A database has data and relationships.	TRUE/FALSE
3.	Metadata is the data about data, such as record and field definitions, synonyms, data relationships, validation rules, help messages and etc.	TRUE/FALSE
4.	The select operation function in relational algebra is identical to the where clause in SQL.	TRUE/FALSE
5.	In a relation, the rows are sometimes called "records".	TRUE/FALSE
6.	Conventional files are relatively difficult to design and implement because they are normally designed for use with multiple applications or information systems.	TRUE/FALSE
7.	The Data Definition Language (DDL) is used to create, read, update, and delete records in the database and to navigate between different records and types of records.	TRUE/FALSE
8.	A secondary key is an alternate identifier for a database. Its value may identify either a single record or a subset of all records.	TRUE/FALSE
9.	The SQL UPDATE operation changes the table structure while leaving the data intact.	TRUE/FALSE
10.	SUM and AVG functions work on only numeric data types.	TRUE/FALSE

PART B : STRUCTURED QUESTIONS 50 MARKS

INSTRUCTION : ANSWER ALL QUESTIONS.
Please write your answer in the answer sheets.

QUESTION 1 (15 marks)

1. Database Management System (DBMS) environment consist of several components including data. List the other remaining components. (2 marks)

2. You are assigned as a consultant to upgrade existing approach used by the Company ABC to Database approach. Figure 1 shows the approach used by the ABC Company.

   a) Discuss **THREE (3)** weaknesses of the File-Based approach (3 marks)

   b) Based on **Figure 1**, draw the Database Approach for Company ABC which consist of **database, database application, database management system and database system.** (2 marks)

   c) Briefly explain **THREE (3)** roles that you need to hire in order to implement the database approach. (3 marks)

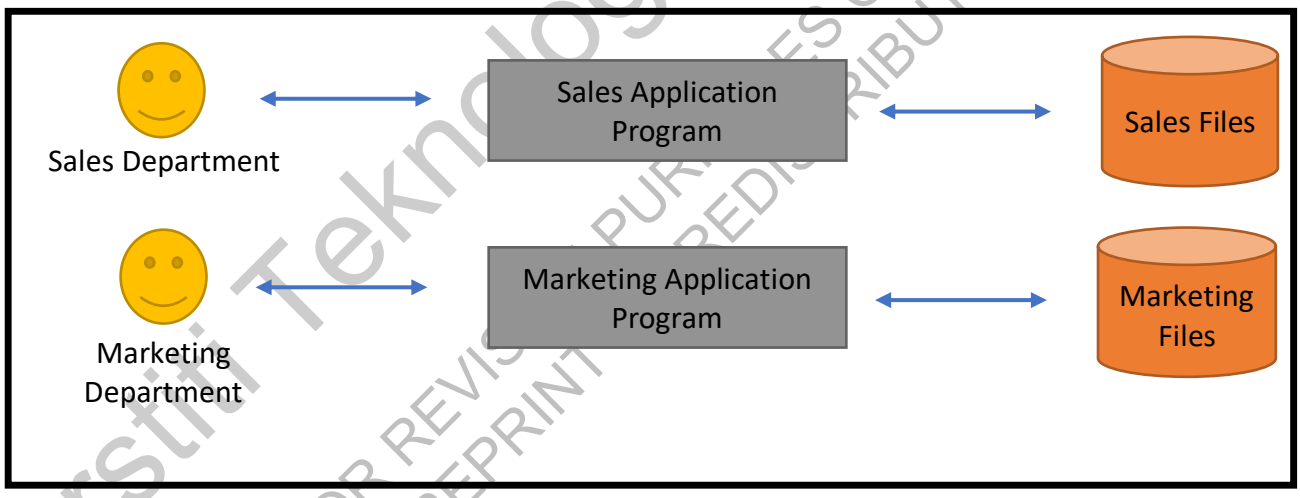

Figure 1.1: File-Based Approach for Company ABC

3. Database Management System (DBMS) are built based on the ANSI-SPARC Three Level Architecture as shown in Figure 2 below.

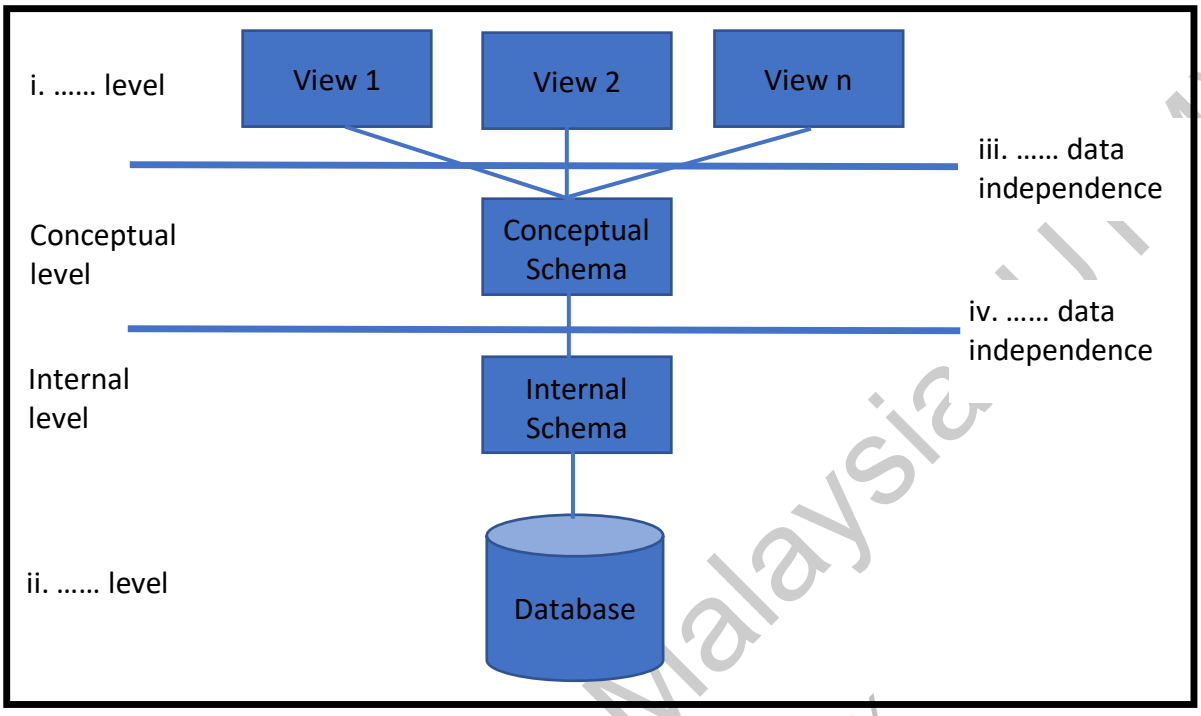

Figure 1.2: ANSI-SPARC Three Level Architecture

a) Fill in the **FOUR (4)** blanks in Figure 2 (2 marks)

b) Describe the **THREE (3)** main levels of ANSI-SPARC Three Level Architecture

(3 marks)

QUESTION 2 (15 marks)

Instruction: According to the **Table 2.1, 2.2** and **2.3** below, answer all of the following questions.

Table 2.1: Staff

cont_ID	cont_Name	cont_DOB	gender	fee_payment
124	Harris Sampson	23 July 1992	Male	Paid
235	Imaani Gonzales	12 May 1997	Male	Paid
622	Aneesah Vo	10 December 1990	Female	Paid
128	Rupert Chavez	04 June 1995	Male	Not paid
569	Nawal Hale	07 April 1989	Female	Not paid
317	Rhea North	01 August 1994	Female	Paid
780	Zane Mcfadden	28 January 1997	Male	Paid
143	Tasnia Garza	07 July 1993	Male	Paid

Table 2.2: Game

game_ID	cont_ID	Name	Type
128	OG1	Age of Empires	MOG
622	FP1	Battlefield V	FPS
569	OG2	Battlefield Heroes	MOG
317	OG3	Bloodline Champions	MOG
235	FP2	Insurgency: Sandstorm	FPS
780	FP3	OVERKILL's The Walking Dead	FPS
569	OG4	Company of Heroes	MOG
124	FP4	Far Cry 5	FPS
317	OG5	Dota 2	MOG
143	FP5	Call of Duty: Black Ops 4	FPS

Table 2.3: Tournament

cont_ID	game_ID	location	tournament_Date	time_Start
128	OG1	Room 4	29 December 2018	1030
622	FP1	Room 3	29 December 2018	1430
569	OG2	Room 5	30 December 2018	1030
317	OG3	Room 5	30 December 2018	1420
235	FP2	Room 2	30 December 2018	1430
780	FP3	Room 1	29 December 2018	1030
569	OG4	Room 1	29 December 2018	1430
124	FP4	Room 3	30 December 2018	1030
317	OG5	Room 2	30 December 2018	1030
143	FP5	Room 4	29 December 2018	1430

3(a) According to the tables above, answers the questions in Relational Algebra **expression**:

(i) Find all contestants who have not paid their entrance fees.

(1 mark)

(ii) List the game ID and name where the type of game is MOG (Multiplayer online Game). (1 mark)

(iii) List the female contestants who registered to compete in FPS (First Person Shooter) game.

(2 marks)

(iv) List the contestants whom will be competing in the game 'Battle Heroes' on 30th of December 2018.

(3 marks)

(v) Identify all location, tournament_Date and game Name for 'Aneesah Vo'.

(3 marks)

3(b) Create the virtual table that contains the data in Table 1 and 2 that would be produced by the following Relational Algebra expressions:

(i) $(\sigma$ cont_DOB $\leq$ '10 December 2018' ^ '07 July 2018' (Contestant) $\bowtie$ Contestant.cont_ID = Game.cont_ID (σ Type = 'MOG' (Game))))

(2.5 marks)

(ii) Π cont_Name, cont_ID (Π cont_Name, cont_ID (Contestant) – ((Π cont_Name, cont_ID (Contestant) $\bowtie$cont_ID(σ Type = 'FPS' (Game)))

(2.5 marks)

QUESTION 3 (15 marks)

Consider the following relations in a Clinic – Patient System:

Patient (**pID**, pName, pGender, pDOB, pAddress, pContact)
Doctor (**dID**, dName, dContact)
Registration (**rID,** rDate, pID, dID, prescription)
Foreign key: pID references **Patient** (pID)
dID references **Doctor** (dID)

Table 3.1: Structure for **Patient** relation

Attribute	Data Type	Constraints
pID	Integer	Primary Key
pName	Variable character of length 50	
pGender	Variable character of length 10	
pDOB	Date	
pAddress	Variable character of length 80	
pContact	Integer	

Table 3.2: Structure for **Doctor** relation

Attribute	Data Type	Constraints
dID	Integer	Primary Key
dName	Variable character of length 50	
dContact	Integer	

Table 3.3: Structure of **Registration** relation

Attribute	Data Type	Constraints
rID	Integer	Primary Key
rDate	Date	
pID	Integer	Foreign Key where reference relation is **Patient** (pID)
dID	Integer	Foreign Key where reference relation is **Doctor** (dID)
prescription	Variable character of length 100	Default value "NA"

Construct the SQL Data Definition Language (DDL) statement for the following queries:

a) Construct the **Patient** relation without constraints. (3 marks)

b) Add the constraints into **Patient** relation. (1 mark)

c) Construct the **Registration** relation with constraints. (4 marks)

d) Add a new column named *Nationality* into the **Patient** relation where the data type is variable character of length 15 and is set to NOT NULL. (3 marks)

e) Delete the column *prescription* from the **Registration** relation. (1 mark)

f) Create a new relation named **Consultation** that has the same structure as **Registration** relation. (2 marks)

g) Delete the **Registration** relation. (1 mark)

QUESTION 4 (8 marks)

(a) Figure 4.1 is an entity relationship diagram (ERD) for conceptual level. Identify **ALL** errors on the ERD given in Figure 4.1. Provide your answers in Appendix 1 by:

i. Circle the errors identified on the diagram. (3 marks)

ii. For each error identified, correct them. Show your corrections by redrawing the corrected diagram **AND** describing how the errors should be corrected next to the circles that you have identified.

(7 marks)

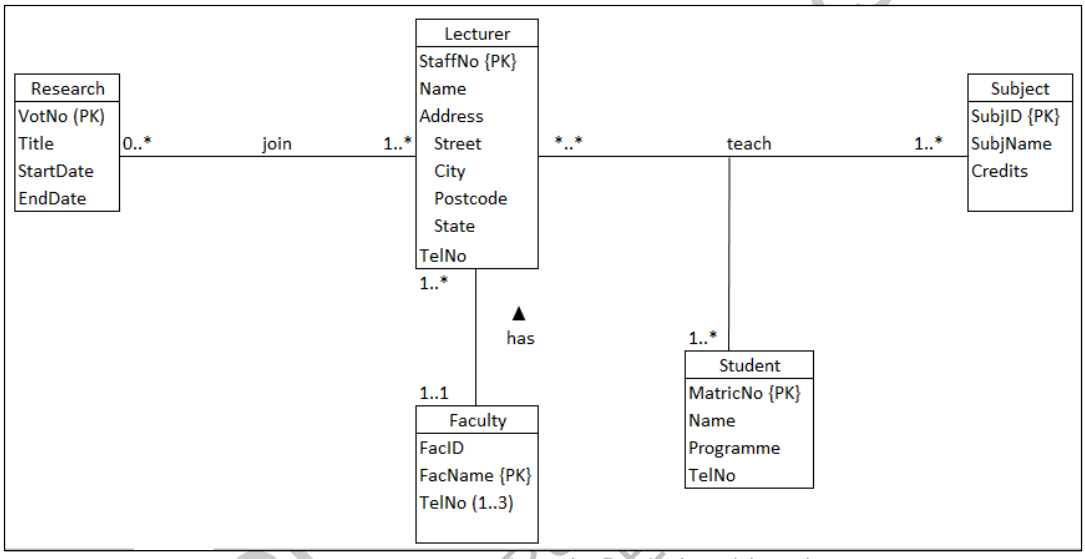

Figure 4.1: Conceptual Entity Relationship Diagram

(b) Use the following business rules to construct the Conceptual Entity Relationship diagram (ERD) and write all the multiplicities into the ERD.

(i) A department employs many employees, but each employee is employed by one department.

(1 mark)

(ii) A division operates many departments, but each department is operated by one division.

(1 mark)

(iii) An employee might be assigned many projects, and a project must have at least one employee assigned to it. (1 mark)

(iv) One of the employees manages each department, and each department is managed by one employee. (1 mark)

(v) One of the employees runs each division, and each division is run by one employee. (1 mark)

PART C : CASE STUDY 30 MARKS

INSTRUCTION : ANSWER ALL QUESTIONS.
Please write your answer in the answer sheets.

UTM Records has decided to store information about musicians who perform on its albums (as well as other company data) in a database. The company has wisely chosen to hire you as a database designer (at your usual consulting fee of RM1500/day).

- Each musician that records at UTM has an SSN, a name, an address, and a phone number. Poorly paid musicians often share the same address, and no address has more than one phone.
- Each instrument used in songs recorded at UTM has a unique identification number, a name (e.g., guitar, synthesizer, flute) and a musical key (e.g., C, B-flat, E-flat).
- Each album recorded on the UTM label has a unique identification number, a title, a copyright date, a format (e.g., CD or MC), and an album identifier.
- Each song recorded at UTM has a title and an author.
- Each musician may play several instruments, and a given instrument may be played by several musicians.
- Each album has several songs on it, but no song may appear on more than one album.
- Each song is performed by one or more musicians, and a musician may perform several songs.

Each album has exactly one musician who acts as its producer. A musician may produce several albums, of course.

(a) Identify all entities and attributes for each entity of this case study. Identify the Primary Keys. Provide your answer in the following format.

ENTITY	ATTRIBUTE

Table C.1: UTM Records entity and attributes

(7 marks)

(b) Identify the main relationship types of this case study. State any assumptions you make about the data. Provide your answer in the following format.

ENTITY 1	RELATIONSHIP	ENTITY 2

Table C.2: UTM Records relationship between entities

(8 marks)

(c) Using your answers for (a) and (b), draw a single ER diagram to represent the data requirements of UTM Records. Determine the multiplicity constraints for each relationship described in (b). Represent the multiplicity for each relationship in the ER diagram. State any assumptions necessary to support your design.

(15 marks)

APPENDIX 1