UTM UNIVERSITI TEKNOLOGI MALAYSIA FAKULTI KOMPUTERAN

MID SEMESTER EXAM

SEMESTER 1 2022/2023

COURSE CODE : **SECD2523**

COURSE NAME : **DATABASE**

YEAR / PROGRAM : **2 SECB/SECJ/SECR/SECV**

DURATION : **2 hours 30 minutes**

DATE :

INSTRUCTIONS TO CANDIDATES:

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

Name	
IC No.	
Matrix No.	
Year / Program	
Course Code/ Section	
Lecturer	

2. Read instructions given for each question carefully.

3. Answer **ALL** questions in the **ANSWER BOOKLET** given.

4. This paper consists of **THREE** parts;
   Part A: 20 MCQ questions
   Part B: 7 STRUCTURED questions
   Part C: 1 CASE STUDY question

5. Submit **BOTH** answering booklet and question booklet at the end of the exam.

THIS PAPER CONSISTS OF 14 (FOURTEEN) PRINTED PAGES INCLUDING THIS PAGE.

PART A: MULTIPLE CHOICE QUESTION (20 MARKS)

1) Which of the following is **NOT** the types of databases?
   A. Cloud database
   B. NoSQL database
   C. Design database
   D. Relational database

2) Which of the following is **FALSE** about the job responsibilities of the database administrator?
   A. Understanding of relational and dimensional data modeling
   B. Install and maintain the performance of database servers
   C. Diagnose and troubleshoot database errors
   D. Develop processes for optimizing database security

3) Ibrahim has recently been assigned to a new database team. He has been given a list of his responsibilities, which include designing and implementing the physical database, ensuring that the database is secure and that the data is stored in accordance with the integrity constraints and rules, while ensuring that applications perform satisfactorily for the user. What is Ibrahim's job title and role, based on the list of his responsibilities?
   A. Data administrator
   B. Database administrator
   C. Database designer
   D. Application programmer

4) In relational model terminology, a table is known as _____.
   A. range
   B. domain
   C. relation
   D. tuple

5) Based on the Figure 1, extract the preferable relation schema for COURSE relation?

COURSE

CourseCode	Name	CrdtHours	StaffNo
AB1004	Introduction to Programming	4	701
AA1003	Information System	3	706
AC1004	C++	4	704
AD1004	Artificial Intelligence	4	705

Figure 1: Relation schema for COURSE.

   A. Course (Course Code, Name, crdthrs, staff)
   B. COURSE (CourseCode, Name, CrdtHours, StaffNo)
   C. COURSE (Name, CddtHours, Staffno)
   D. (Course, Name, CrdtHourse, StaffNo)

6) Determine the **ADVANTAGE/S** of developing a data dictionary in a database.
   A. Significantly reduce the cost of hardware charge and maintenance.
   B. Increase the complexity of the administrator or new DBA to understand the database.
   C. Provide clear details on the relations, views, constraints, and indexes.
   D. Easy to be developed to facilitate the understanding of non-technical users of the system.

7) Below shows examples of relational schema for a university which consist of LECTURER, STUDENT, COURSE and GRADE written as follows:

LECTURER (StaffNo, ICNum, Position, Department)
STUDENT (StdID, Name, CourseCode)
COURSE (CourseCode, Name, Unit, StaffNo)
GRADE (StdID, CourseCode, Gradepoint)

Based on the above relational schema, identify the relational key for attributes CourseCode from the GRADE relation.

A. Superkey
B. Composite key
C. Alternate key
D. Foreign key

8) Which of the following is **NOT** the types of databases?
A. Cloud databases
B. NoSQL databases
C. Design databases
D. Relational databases

9) Every business has restrictions on which attribute values and which relationships are allowed. These are known as:
A. Entities
B. Relationships
C. Constraints
D. Attributes

10) The attribute name could be structured as an attribute consisting of first name, middle initial, and last name. This type of attribute is called?
A. Simple attribute
B. Composite attribute
C. Multivalued attribute
D. Derived attribute

11) Which of the following pairs of entities is most likely to be modeled as a 1:1 relationship?
A. CAR and WHEEL
B. TEACHER and SUBJECT AREA
C. PERSON and FINGERPRINT
D. TREE and BRANCH

12) Analyze the following entity relationship diagram (ERD). Determine all possible business rules from the ERD in Figure 2.

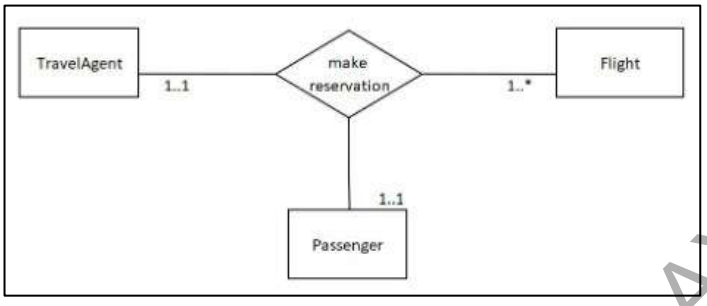

Figure 2: ERD for travel agent.

I. A TravelAgent can make reservation of 1 or more Flight for a Passenger.
II. A TravelAgent can make reservation for 1 or more Passenger.
III. A TravelAgent can make reservation for many Flights.
IV. A Passenger can have 1 or many Flights.

A. I only.
B. I and II.
C. II and III.
D. II and IV.

13) Analyze the following entity relationship diagram (ERD). Determine all possible business rules from the diagram in Figure 3.

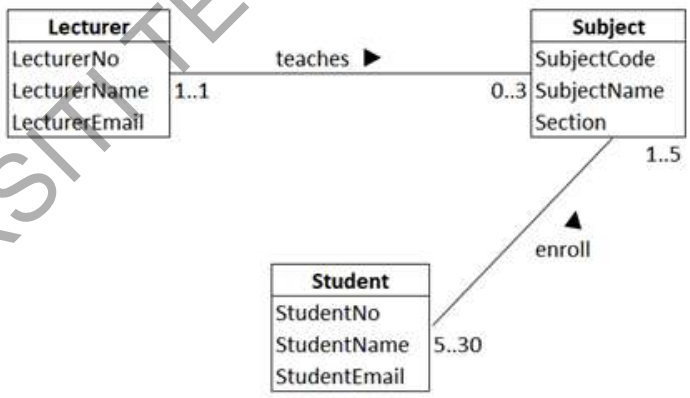

Figure 3: ERD diagram for Lecturer, Subject and Student.

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

14) Which of the statements is **FALSE** about the representation of the ERD in Figure 4?

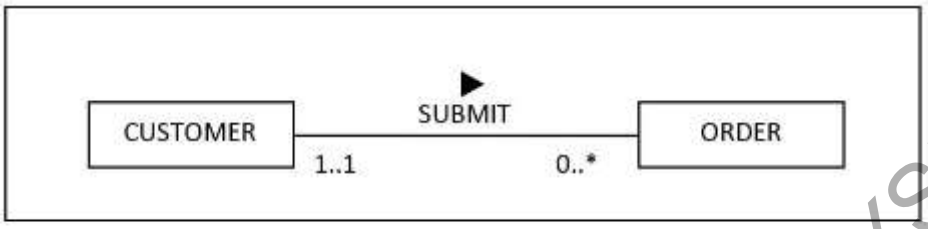

Figure 4: ERD of Customer and Order

A. In SUBMIT relationship, CUSTOMER holds a mandatory participation while ORDER holds an optional participation.
B. The SUBMIT relationship is a one-to-many relationship.
C. A customer can have more than one order or doesn't have any order at all.
D. An order submitted always belongs to one customer only.

15) Which of the following statements is FALSE about subclass?

A. Each subclass has its own unique attributes.
B. An entity type that represents a general concept at a high level.
C. Inherits all attributes of the superclass.
D. Subclass can have their unique relationships with other entities.

16) Based on the description given, determine the participation and disjoint constraints of a superclass/subclass relationship in Figure 5.

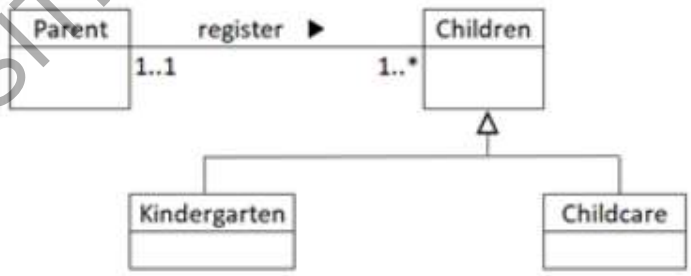

Figure 5: Enhanced ERD of Parent and Children.

Parents are required to register their children either to join kindergarten only or kindergarten and childcare.

A. {Mandatory, OR}
B. {Mandatory, AND}
C. {Optional, OR}
D. {Optional, AND}

17) A publication management system records and manages different types of publications. Majority of the publications are in the forms of journal articles, textbooks, novels. All the journal articles are divided into indexed and non-index publications.

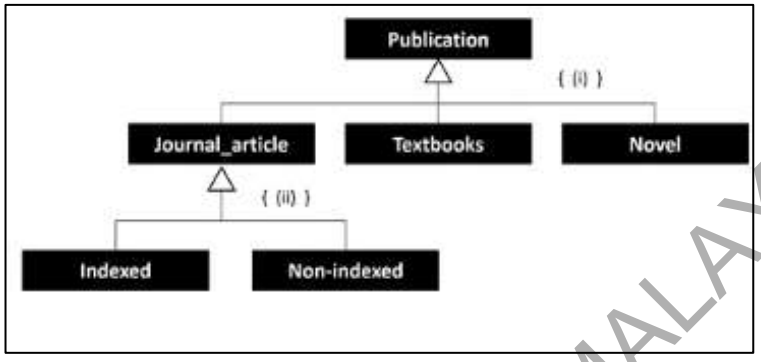

Figure 6: ERD of publication management system

Based on the situation above, fill in the constraints for the structure in Figure 6.

A. {mandatory, or} (ii) {mandatory, or}
B. {optional, and} (ii) {mandatory, and}
C. (i) {optional, or} (ii) {mandatory, or}
D. (i) {optional, or} (ii) {mandatory, and}

18) Mr. Akmal owns a computer repair shop that provides computer components and system repair services. All his technicians can be divided into regular and on-call, where permanent technicians are those who are hired permanently by the shop and provided a designated monthly salary. Majority of the permanent technicians are focused on laptop components repair and desktop motherboard repair. Some of them are able to do both. Meanwhile on-call technicians are the external technicians who are requested by the shop whenever there are overwhelming repair jobs or special repair cases. These on-call technicians will have their hourly pay rate.

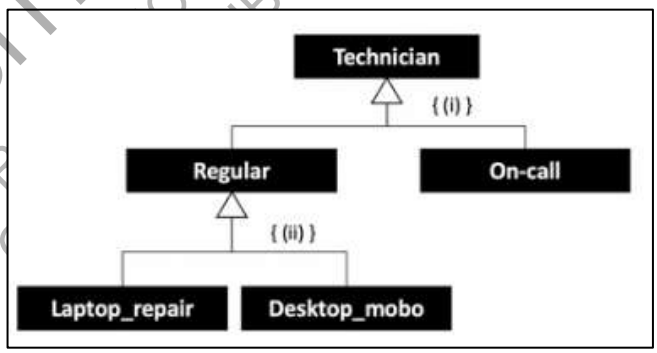

Figure 5: ERD of computer repair shop.

Based on the given situation, fill in the constraints for the structure in Figure 5:

A. (i) { Mandatory, OR } (ii) { Mandatory, AND}
B. (i) { Mandatory, OR } (ii) { Optional, OR }
C. (i) { Mandatory, OR } (ii) { Optional, AND }
D. (i) { Optional, OR } (ii) { Optional, AND}

19) Which of the following are two good examples of ENTITY: Instance?

I. BOOK: Biography of Mahatma Gandhi
II. DAIRY PRODUCT: milk
III. TRAIN: runs
IV. VEGETABLES: grows

A. I and II
B. II and III
C. II and IV
D. III and IV

20) Which of the following statements is **NOT** part of the main reasons of changing File-based approach?
   A. Data redundancy
   B. Separation and isolation of data
   C. Duplication of data
   D. Reduce data storage

PART B: STRUCTURED QUESTION (60 MARKS)

QUESTION 1 [8 MARKS]

You might not realize it, data are everywhere. Whether or not you know very much about them, their effect on your daily life is extensive. From weather applications to the movies you watch online, databases support nearly every service you use on a regular basis. Data helps companies make intelligent decisions about planning their marketing campaigns, managing finances, and developing new products. However, data can become quite overwhelming when it's not organized correctly. To put it simply, businesses are drowning in data.

a) What is database? **ONE** example of database.

(2 Marks)

b) Identify **ONE** example of relational and non-relational DBMS.

(2 Marks)

c) Give **TWO** important point, comparison of database and file-based approach.

(4 Marks)

QUESTION 2 [7 MARKS]

A hotel database shall provide the following information:

Table 1: Information about Guests

IdGuest	FirstName	Last Name
1	Ahmad	Hisham
2	Muhammad	Anas
3	Siti	Aminah

Table 2: Information about Rooms

RoomNumber	Type	Rate
201	Single	180
202	Double	230
203	Single	190

Table 3: Information about Stays

IdGuest	RoomNumber	Date
1	202	1/1/2022
1	203	5/5/2022
2	201	1/10/2022

Based on the above Table 1,2,3, answer the following questions:

a) Identify **TWO (2)** relation instances from table *Guests*.

(1 Mark)

b) Identify the attributes for *Guests* and how many degrees?

(2 Marks)

c) Identify the primary key for *Rooms*.

(1 Mark)

d) The possible foreign key for *Stays* information.

(1 Mark)

e) Explain about the referential Integrity in between *Room* and *Stays* information.

(2 Marks)

QUESTION 3 **[8 MARKS]**

a) State the differences between conceptual, logical and physical design.
(The comparison should be done in a table form)

(2 Marks)

b) Explain **THREE (3)** stages that are involved in Database System Development Lifecycle (DBSDLC).

(6 Marks)

QUESTION 4 **[7 MARKS]**

Below explain a conceptual data model for a library database. Consider the below criteria's:

i. The library can have zero or many books
ii. Each physical book can be associated with one and only library.
iii. The same goes for the relationship between the library and its members.
iv. A member can have zero or many loans and a loan can be associated with one and only member.
v. Each book can be associated with zero or one loan, while a loan can be associated with one and only one book.

Based on the above business rules:

a) Identify all possible entities.

(2 Marks)

b) Complete a Data Dictionary for the library database.
(*Use table below to show your answer)*

Entity Name	Description	Aliases	Occurrence

(2 Marks)

c) Identify the relationship occur between entities.
(*Use table below to show your answer)*

Entity Name	Multiplicity	Relationships	Entity Name	Multiplicity

(3 Marks)

QUESTION 5 **[4 MARKS]**

a) Define what is entity type.

(2 Marks)

b) Describe the two categories of entity type.

(2 Marks)

QUESTION 6

[11 MARKS]

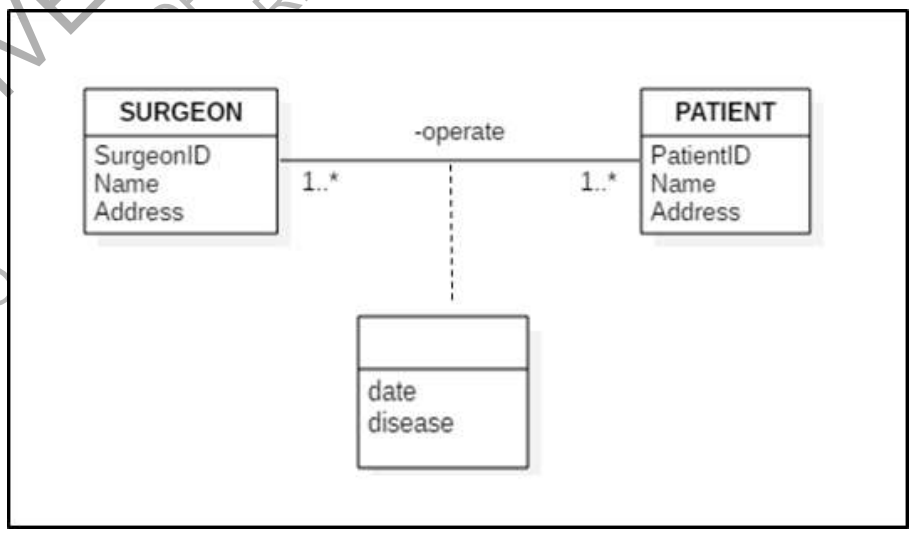

Figure 6: Entity Relationship Diagram

Based on the multiplicity values shown in **Figure 6** entity relation diagram (ERD), determine the followings:

a) The cardinality constraint for the **OPERATE** relationship.

(1 Mark)

b) The participation constraints for the **SURGEON** entity and **PATIENT** entity.

(2 Marks)

c) The entity type for the **SURGEON** entity and **PATIENT** entity.

(2 Marks)

d) The Scenario:

Consider the following automotive enterprises, involving cars, car manufacturers, and car dealerships. Car manufacturers (like Honda Motor Company, Perusahaan Otomobil Nasional (PROTON), Mercedes-Benz, BMW, General Motors (GM), etc.) are companies that build cars, and they have attributes such as name, headquarters address, country of incorporation, etc. Cars have attributes such as make (e.g., Honda, Proton, Ford, Volkswagen, Mercedes, etc.), model (e.g. Saga, Iriz, Civic, Accord, etc.), and kind of car (e.g., sedan, SUV, wagon, etc). A dealership sells cars. It has a name, address, and telephone numbers (typically more than one.) Each manufacturer builds at least one car. A manufacturer may make several different kinds and models of cars (as, for example, the manufacturer Mercedes or PROTON does). A car is made by a single manufacturer. A dealership can sell cars from several different manufacturers but does not have to sell all the cars from a single manufacturer. For example, Lestari_Car in Pontian sells Pontiacs from manufacturer GM and Hondas from manufacturer Honda, but it doesn't sell Chevrolets that are also made by GM. Each dealership sells at least one car, and the date of sale is recorded. A manufacturer can make a car (such as a racing car) that is not sold through dealerships.

Based on the scenario given, draw a conceptual entity relationship diagram (ERD) using UML notation to represent the data model.

(6 Marks)

QUESTION 7 **[15 MARKS]**

a) Distinguish between disjoint and non-disjoint constraints in the Enhanced ERD.

(2 Marks)

b) Determine the participation and disjoint constraints for each description given in Figures 7, 8 and 9.
[Note: Indicate with {a,b}, {c,d} and {e,f}]

i) UTM Libraries manage a wide range of references, including books, theses, and journals.

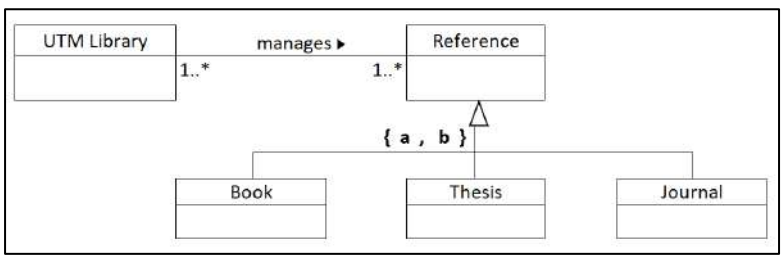

Figure 7: EERD

(2 Marks)

ii) Faculty of Computing employees are classified as administrators, support staff, and academic staff. Some academic staff are administrators. Allowance is recorded for the administrator, while overtime is recorded for support staff.

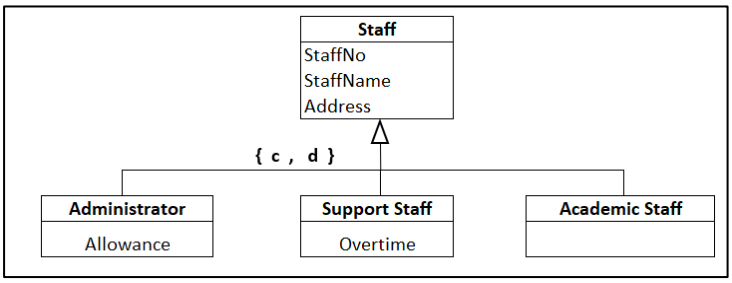

Figure 8: EERD (2 Marks)

iii) The SOMECAR company rents two types of vehicles: cars and trucks. The number of passengers and the maximum speed of a car type vehicle are recorded. In the case of a truck, the axle number and tonnage of the truck are recorded.

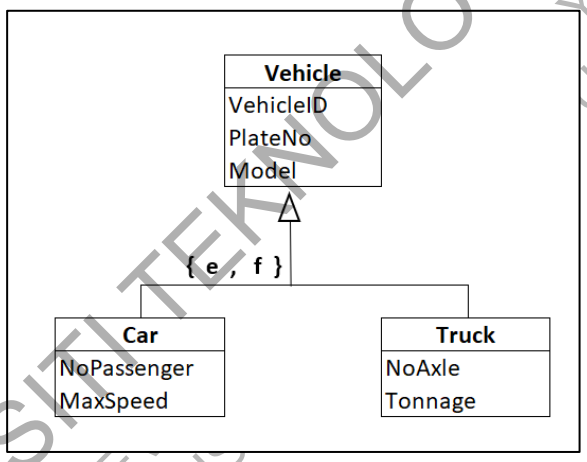

Figure 9: EERD (2 Marks)

c) Consider the following requirements for the company MILLIONNAIRE Sdn. Bhd. database, which is used to keep track of employee information.

- Syarikat MILLIONNAIRE Sdn. Bhd. keeps track of each employee's ID, name (first and last name), current address, and phone number.
- Some applications require the city, state, and ZIP code of the employee's current address.
- The data stored on the bank account includes the bank account number, account type, and bank name.
- Each employee owns one or more type of account that are categorized as saving account or current account.

Based on the requirements, draw a conceptual Entity-Relationship Diagram (ERD) or Enhanced ERD.

(7 Mark)

PART C: CASE STUDY QUESTION (20 MARKS)

Your company was assigned to develop a data model for a database application system for a small retail store called Johor Soccer League (JSL). The JSL store sells merchandise items from local soccer team. Each item would be associated with a local soccer team. Customers are free to purchase any item and the item would be recorded for future reference. Figure xx below shows the ERD for the JSL store (note that all attributes should not be null).

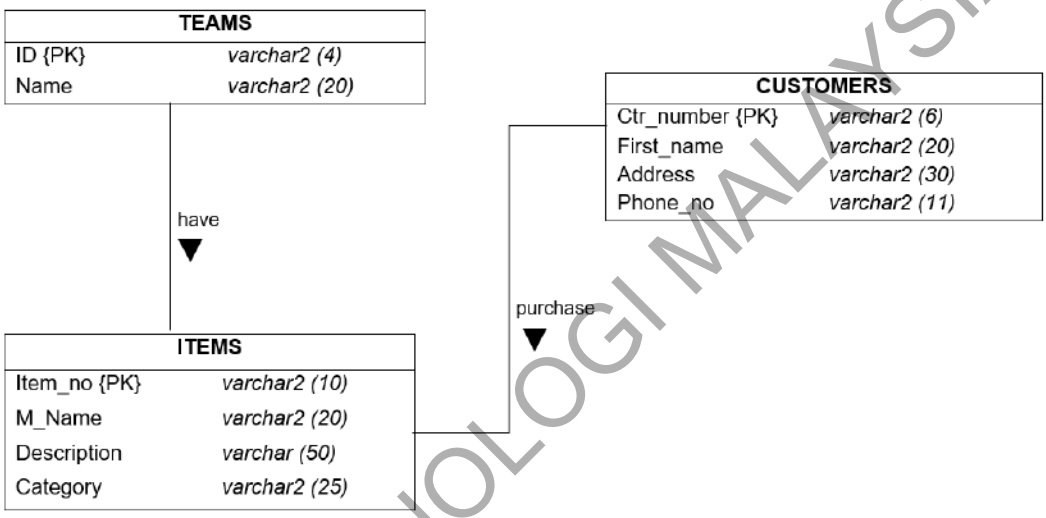

Figure 10: ERD of Johor Soccer League retail store

Construct SQL statements for each of the following problems.

1. Based on the ERD in Figure 10, create all tables for JSL store.

(5 marks)

2. Add new attribute in table:

   a. TEAMS named *colour* with datatype Varchar2 with size 50.
   b. CUSTOMERS named *last_name* with datatype Varchar2 with size 30.

(2 marks)

3. Rename attribute *name* to *team_name* in table TEAMS.

(1 mark)

4. For table ITEMS:

   a. Remove attribute *description* from table ITEMS.
   b. Change the *category* datatype to number with size 2.

(2 marks)

5. Refer to table TEAMS and ITEMS below, insert the **first two rows** into the assigned table:

   a. Table name: **TEAMS**

id	team_name
JYT	Yes Team
JTB	Tiger Best
JSG	South Group
JBP	Black Pack
JAE	Awesome Eagle

b. Table name: **ITEMS**

item_no	m_name	size	team_id
JYT001	YT Jersey	32	JYT
JYT002	YT Jersey	34	JYT
JSG011	SG Jersey	40	JSG
JBP001	BP Jersey	40	JBP
JSG021	SG Boot	36	JSG
JAE001	AE Shorts	32	JAE

(4 marks)

6. Assumed the data in table CUSTOMERS was inserted to the database.

Table name: **CUSTOMERS**

ctr_number	first_name	last_name	phone_number	item_no
1567	Edwin	Wong	0187562599	JSG021
7892	Mohamad	Faiz	0178890040	JAE001
…				
…				
8782	Mohamad	Omar	0169064690	JSG021
9088	Alifah	Amran	0113679081	JBP001

a. The cashier was informed that a customer, Hanom (ID = 8090), changed her phone number. Update her phone number to 019-3995678.
b. Customer named Azizan noticed that his last name was wrongly keyed in to the system, update her last name to Harun.

(5 marks)

7. The stock manager noticed that all YT jerseys were sold out. Delete all items with m_name = YT Jersey.

(1 mark)