CS2102 Database Systems

Semester 1 2019/2020

Assignment 02

DEADLINE: 14 September 2019 **4 MARK**

1 Introduction

This assignment will use Examplify software. The questions written here is only for reference. You should attempt the assignment on Examplify. This assignment is also intended to test your system for stability. In particular, you need to check if you can run `psql` on a non-secure assessment with no internet connection.

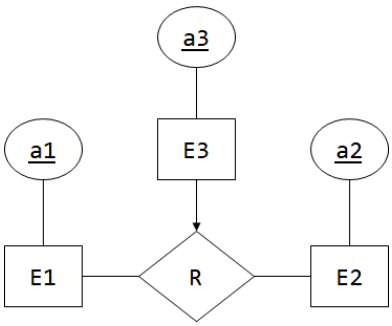
This assignment will assess on ER diagram together with SQL table creation and/or alter. The total marks for the assignment is 4.5 marks but will be capped at 4 marks. There is a 0.5 mark bonus for diagnostic question (i.e., Question 0). The password (*case-sensitive*) for this assignment is **`cs2102_assignment2`**. In case you suspend the exam, the resume code is **`58F850`**. The deadline for the assignment is **14 September 2019**.

2 Questions

Question 1

[0.5 mark] Consider the ER diagram shown below, with the following properties:

- There are 20 entities in `E1`
- There are 5 entities in `E2`
- There are 10 entities in `E3`

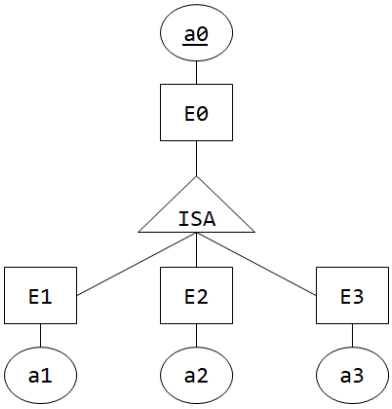


What is the minimum and maximum number of entities in the relationship set `R`?

Question 2

[0.5 mark] Consider the ER diagram shown below, with the following properties:

- There are 15 entities in `E1`
- There are 20 entities in `E2`
- There are 25 entities in `E3`
- The ISA hierarchy does not satisfy the overlap constraint
- The ISA hierarchy satisfies the covering constraint

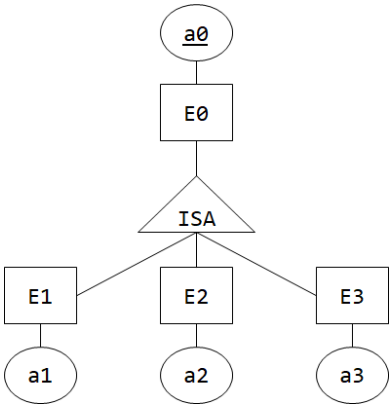


What is the minimum and maximum number of entities in entity set `E0`?

Question 3

[0.5 mark] Consider the ER diagram shown below with the following properties:

- There are 50 entities in `E0`
- There are 25 entities in `E1`
- There are 15 entities in `E2`
- The ISA hierarchy satisfies the overlap constraint.
- The ISA hierarchy satisfies the covering constraint.



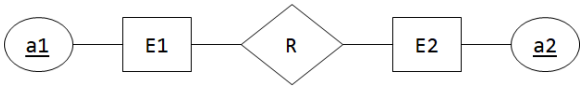
What is the minimum and maximum number of entities in entity set `E3`?

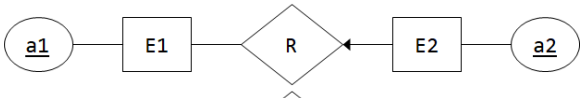
Question 4

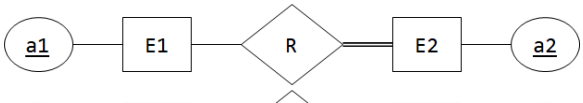
[0.5 mark] Consider the following relational schema:

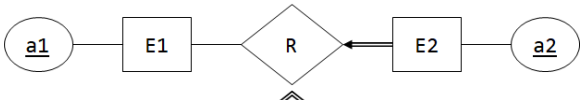
```
CREATE TABLE E1 (
  a1  integer  PRIMARY KEY,
);
CREATE TABLE E2 (
  a1  integer REFERENCES E1 (a1) ON DELETE cascade,
  a2  integer,
  PRIMARY KEY (a1, a2)
);
```

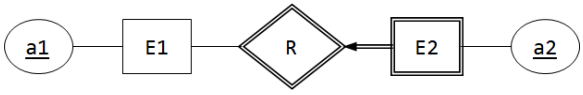
Which of the following ER diagram has its constraints captured by the relational schema above? If there are multiple answers, select all that applies.

A. 

B. 

C. 

D. 

E. 

F. None of the above.

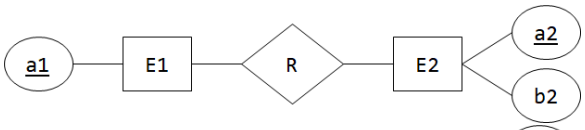
Question 5

[0.5 mark] Consider the following relational schema:

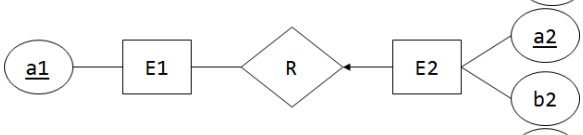
```
CREATE TABLE E1 (
  a1  integer  PRIMARY KEY,
);
CREATE TABLE E2 (
  a1  integer REFERENCES E1 (a1) ON DELETE cascade,
  a2  integer,
  b2  integer,
  PRIMARY KEY (a1, a2)
);
```

Which of the following ER diagram has its constraints captured by the relational schema above? If there are multiple answers, select all that applies.

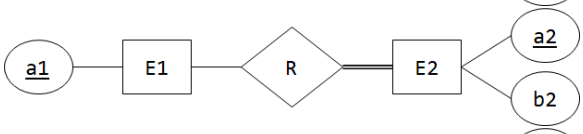
A.



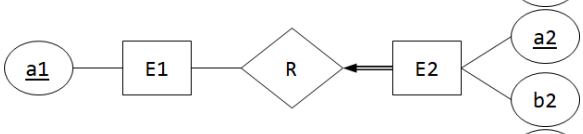
B.



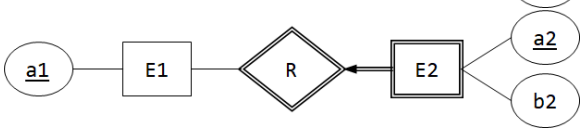
C.



D.



E.



F. None of the above.

Question 6

[0.5 mark] Which of the following statements are `TRUE`? Select all that applies.

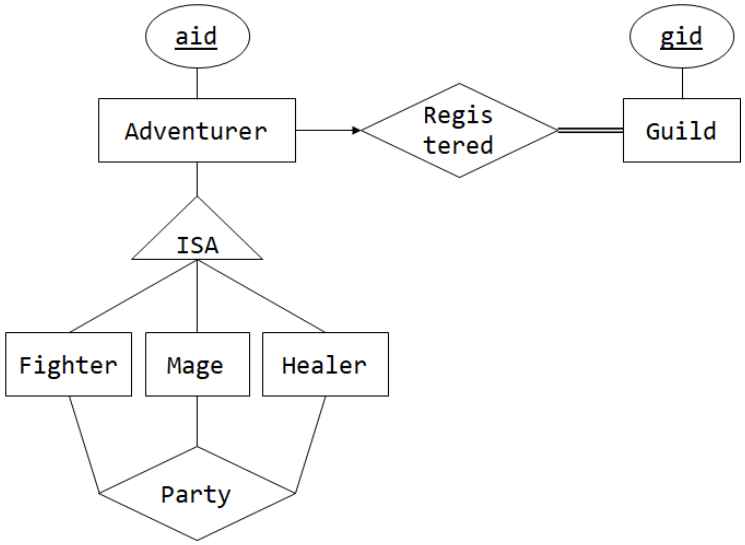
A. Any primary key constraints can always be enforced by column constraints
B. Any foreign key constraints can always be enforced by table constraints
C. Any not null constraints can always be enforced by table constraints
D. Any unique constraints can always be enforced by column constraints
E. All the statements above are `FALSE`

Question 7

[0.5 mark] Consider an application about a fictional world of RPG. You are given the following constraints:

C1. Every adventurer (identified by `aid`) must either be a fighter, a mage, or a healer.
C2. Every adventurer must belong to only one of the three classes (fighter, mage, or healer).
C3. Every adventurer must be registered to exactly one guild (identified by `gid`)
C4. Each guild must have at least one adventurer but may have more than one adventurer.
C5. Each party must have exactly one fighter, one mage, and one healer.

You are given the following ER diagram. Which of the following statements are `TRUE`? If there are multiple answers, select all that applies.



A. Constraint C1 is not captured by the ER design
B. Constraint C2 is not captured by the ER design
C. Constraint C3 is not captured by the ER design
D. Constraint C4 is not captured by the ER design
E. Constraint C5 is not captured by the ER design
F. All constraints are captured by the ER design

Question 8

[0.5 mark] Consider an application about a fictional world of RPG. You are given the following constraints:

C1. Every adventurer (identified by `aid`) must either be a fighter, a mage, or a healer.
C2. Every adventurer must belong to only one of the three classes (fighter, mage, or healer).
C3. Every adventurer must be registered to exactly one guild (identified by `gid`)
C4. Each guild must have at least one adventurer but may have more than one adventurer.
C5. Each party must have exactly one fighter, one mage, and one healer.

Instead of ER diagram, you are now given the relational schema as follows:

```
CREATE TABLE Adventurer (
  aid  integer PRIMARY KEY,
  type varchar(10) NOT NULL,
  CHECK (type = 'fighter' OR type = 'mage' OR type = 'healer')
);
CREATE TABLE Guild (
  gid  integer PRIMARY KEY,
  aid  integer NOT NULL REFERENCES Adventurer (aid)
);
CREATE TABLE Party (
  fighter integer REFERENCES Adventurer (aid),
  mage    integer REFERENCES Adventurer (aid),
  healer  integer REFERENCES Adventurer (aid),
  PRIMARY KEY (fighter, mage, healer)
);
```

Which of the following statements are TRUE? If there are multiple answers, select all that applies.

A. Constraint C1 is not captured by the schema
B. Constraint C2 is not captured by the schema
C. Constraint C3 is not captured by the schema
D. Constraint C4 is not captured by the schema
E. Constraint C5 is not captured by the schema
F. All constraints are captured by the schema