Mid Exam Schema Semester A172 - STID 3014 Database System and Information Retrieval

SECTION A (30 MARKS)
Instruction: Answer **ALL** questions on the space provided.

1. State **TWO (2)** problems of file-based system. For **EACH** of the problem describe how a database management system (DBMS) can resolve the problems.

(4 marks)

Problem 1: Separation and isolation of data. Each program maintains its own set of data.
Solution: In DBMS data is stored in stored in a central location with standardized format

Problem 2: Data dependence. File structure is defined in the program code.
Solution: In DBMS, ANSI SPARC architecture, separates the data and the structure.

Or any suitable problems and solutions

2. There are **THREE (3)** different types of schema corresponding to the three levels in the ANSI-SPARC architecture as shown in the Figure 1 below.

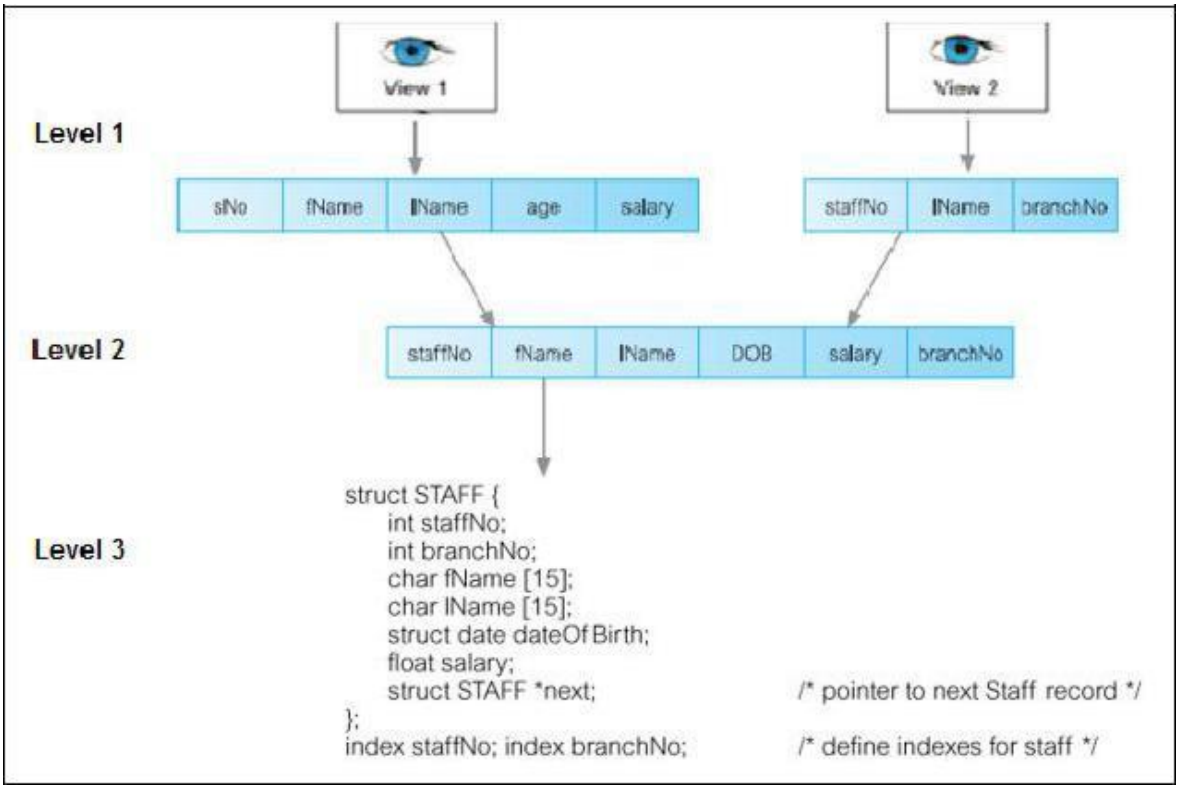


Figure 1: The three levels ANSI-SPARC architecture

State and describe **TWO (2)** of the schemas level.

(4 marks)

Select two (2): Marking scheme 1 mark for state the schema, 1 mark for describing

1. **The external schemas** describe the different external views of the data and there may be many external schemas in a given database.
2. **The conceptual schema** describes all the data items and relationships between them, together with integrity constraints (later). There is only one conceptual schema per database.
3. **The internal schema** on lower level contains definitions of the stored records, the methods of representation, the data fields, and indexes. There is only one internal schema per database.

3. List **TWO (2)** criteria to produce an optimal data model.

(2 marks)

Select two (2):

- Structural validity – consistency with the way the enterprise defines and organizes information
- Simplicity – ease of understanding by IS professionals and non-technical users
- Expressibility – ability to distinguish between different data, relationship between data and constraints
- Nonredundancy – exclusion of extraneous information, in particular the representation of any one piece of information exactly one.
- Shareablity – not specific to any particular application or technology and thereby useable by many.
- Extensibility – ability to evolve to support new requirements with minimal effect on existing users.
- Integrity – consistency with the way the enterprise uses and manages information.
- Diagramatic – ability to represent a model using an easily understood diagrammatic notation.

4. List **THREE (3)** types of binary relationships that commonly exist in Entity Relationship Diagram (ERD).

(3 marks)

- **One-to-one (1:1)**
- **One-to-many (1:*)**
- **Many-to-many (*:*)**

5. **Figure 2** below is an example of entity relationship diagram for a College Database. Each Trainee will be assigned under specific Instructor and will follow all programs conducted by the Instructor. Investigate the diagram and answer the following questions.

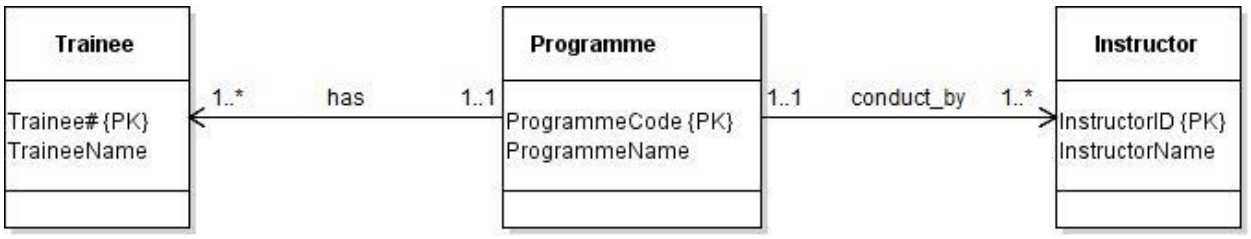


Figure 2: Entity Relationship Diagram for College Database

a) Identify **ONE (1)** possible trap that may occur.

(1 mark)

Fan Trap

b) Justify your answer in (a) and provide suitable example to support your answer.

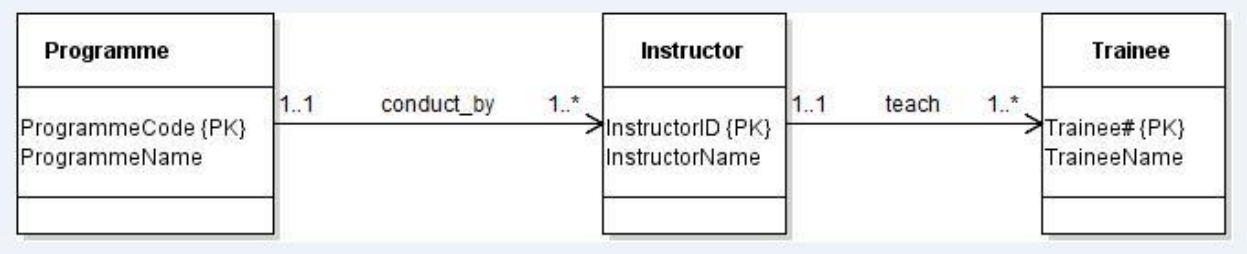
(2 marks)

Fan Trap - **Where a model represents a relationship between entity types, but pathway between certain entity occurrences is ambiguous.**

Example: How to know the trainees under which instructors? Can also provide example of semantic net to show the fan trap

c) Based on answer in (b), redraw entity relationship diagram to resolve the identified problem.

(3 marks)



6. In relational model terminology,

   a) table is considered as _____ **(1 mark)**

      Relation/Class/File

   b) column is considered as _____ **(1 mark)**

      Attribute/Field

7. Given the relational schema as follows:

```
Course(Course_ID, CourseName, Semester, SchoolName)
School(SchoolName, Specialization)
```

   Based on the above relations, identify the followings:

   a) Candidate keys for relation Course. **(2 marks)**

      Course_ID, CourseName

b) Primary key for relation Course. **(1 mark)**

Course_ID

c) Foreign key for relation Course. **(1 mark)**

SchoolName

d) The degree of relation School. **(1 mark)**

2

e) Assume that students are allowed to view the courses and the schools that offer the course from the above relation. Write a complete **relation schema** to represent the students' view.

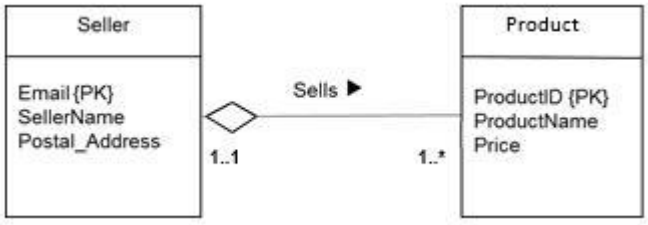
(2 marks)

Student_View (Course-ID, CourseName, SchoolName)
PRIMARY KEY CourseID
FOREIGN KEY (SchoolName) Reference School (SchoolName)

8. The following is the Entity Relationship Diagram (ERD) for the crash trading website.

Assume that exist an **aggregation** relationship between the Seller and the Product, redraw the above ERD with an additional shape that represents the aggregation relationship.

(2 marks)



SECTION B (20 MARKS)
Instruction: Answer **ALL** questions on the space provided.

1. Investigate the following case study

   The Penang Museum has a collection of art objects. The museum's management has decided to use a database system for maintaining the information of their art collection.

   Each art object has a unique id number, an artist (if known), a creation year, a title, and a description. Data regarding the country of origin should be kept track of.

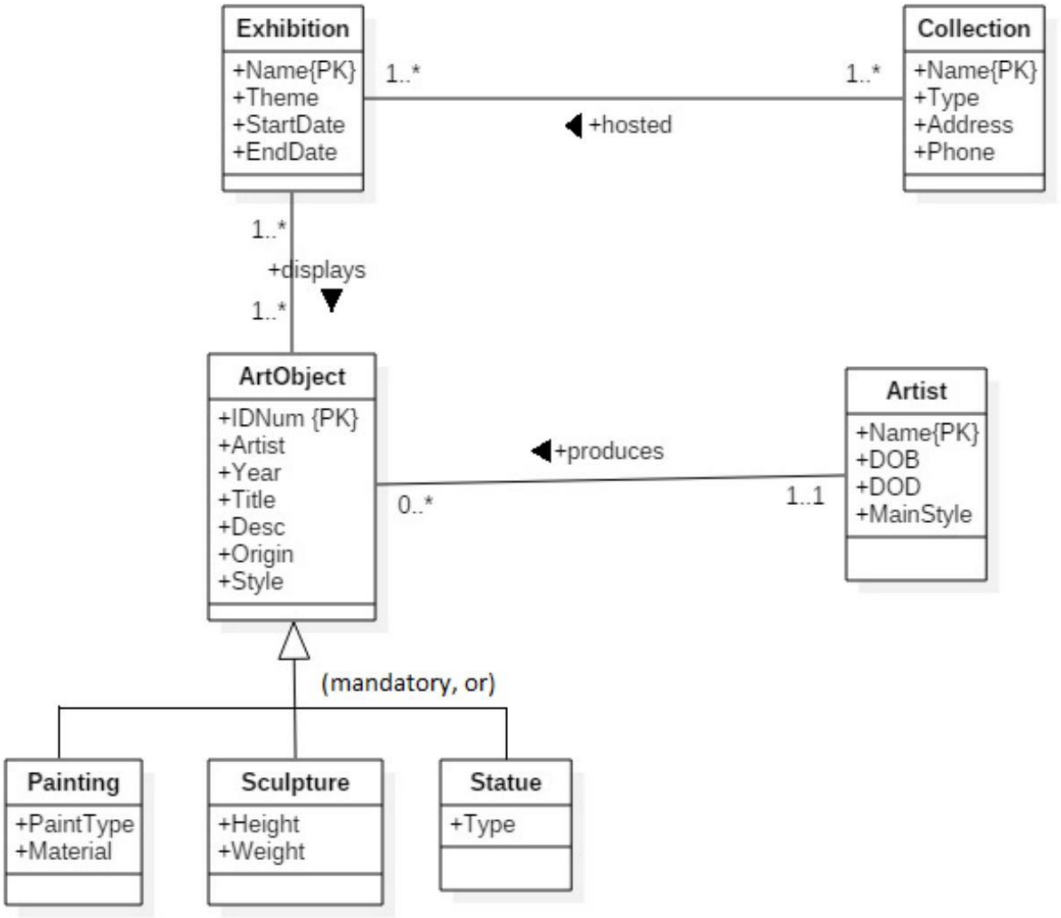
   The art objects are categorized distinctively into painting, sculpture, or statue. A Painting has a paint type (e.g. oil, watercolour), material on which it is drawn on (e.g. paper, canvas, wood, glass), and style (e.g. modern, abstract). A sculpture has height, weight and style. Any art object in the statue category has a type (e.g. photo, hand-made), style and description. Art objects are hosted between various collections and exhibitions.

   There are also some additional required data, which are Artist's information, who produced the art objects. Sometimes the artist has track record of which art objects he or she produced it, otherwise it will remain an 'unknown contribution'. Some artist's information, if known such as the name, date of birth, date of death (if not living), and main style are keep tracked. The name is assumed to be unique.

   A collection represents an organization from which the museum may host at least one art exhibitions. For each collection, the following data is kept track of: names, type (museum, personal), address, and phone. Periodically, different exhibitions take place, where many art objects are displayed. Each exhibition has theme, name (assumed uniquely identify an exhibition), start date and end date.

Draw an **Enhanced Entity Relationship (EER) Diagram** for conceptual data model based on the requirements above. Make sure you clearly state the entity name, attributes (at least three), multiplicity, primary key, specialization or generalization and participation constraints. Steps and documentation for the diagram must strictly follow **Unified Modelling Language (UML)** notation. State any assumptions necessary to support your design.

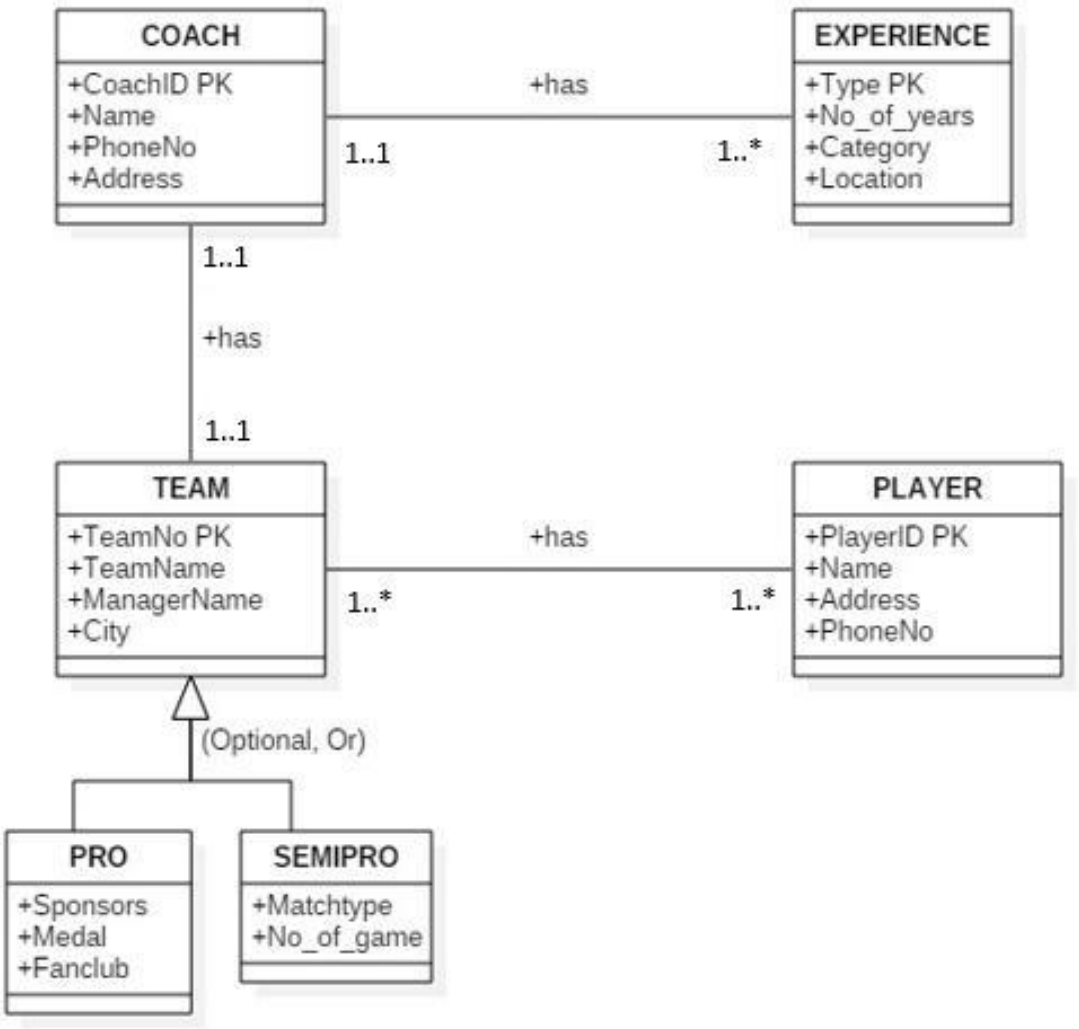
(10 marks)



Marking guideline:

Item	0 – 0.5	1 – 1.5	2
Entities	Notation is not correct Some Entities is missing	Some are correct	All are correct
Attributes & PK	Majority is missing	Some are correct	All are correct
Relationships	Majority is missing relationship and its name	Some are correct with its name	All are correct
Cardinality	Majority is not correct	Some are correct	All are correct
Specialization/Gen	Notation is not correctly captured. Participation and disjoint both are wrong	Notation is correct. Either one Participation and disjoint is not correctly captured.	Notation is correct. Both Participation and disjoint are capture correctly
Total			10

2. Transform the following Enhance Entity Relationship (EER) diagram into Database Relational Model.



(10 marks)

COACH (CoachID, Name, PhoneNo, TeamNo, Type) [0.5m]
PK CoachID [0.5m]
FK TeamNo Reference Team (TeamNo)[0.5m]

EXPERIENCE (Type, No_of_Years, Category, Location, CoachID)[0.5]
PK Type [0.5]
FK CoachID Reference Coach (CoachID)[0.5m]

TEAM (TeamNo, TeamName, MgrName, City)
[0.5m] PK TeamNo [0.5m]

TEAM_PRO (TeamNo, Sponsors, No_of_Medal)
PK TeamNo
FK TeamNo Reference Team (TeamNo)

TEAM_SEMIPRO (TeamNo, MatchType)
PK TeamNo
FK TeamNo Reference Team (TeamNo)

Sub Class
Forming 2 tables with FK = 1.5
M 0.5 for each PK = 1 M

PLAYER (PlayerID, Name, Age, Address, PhoneNo) [0.5m]
PK PlayerID [0.5m]

PLAYER_TEAM (TeamNo, PlayerID)[1m for forming new
table] PK TeamNo, PlayerID[0.5m]
FK PlayerID references Player (PlayerID)[0.5m]
FK TeamNo reference Team (teamno) [0.5m]