CSS325: Database Systems
Midterm Mock Exam

curated by The Peanuts

Name.............ID.............Section.............Seat No.............

Conditions: Open Book

Directions:

1. This exam has 14 pages (including this page). If you lose count, that's already one wrong.

2. Calculators are NOT allowed.

3. Cheating is strictly prohibited. We have eyes everywhere—yes, even in the back row.

4. For inspiration you may look at the ceiling, but not at your friend. The ceiling never writes exams for you, but at least it won't betray you.

5. Good luck! You'll need knowledge, wisdom, and possibly caffeine.

For solution, **click here***.*

Part 1

Question 1.1

Explain the progression from Data to Wisdom in database systems. For each level (Data, Information, Knowledge, Wisdom), provide:

(a) A clear definition

(b) An example from a university student registration system

(c) How it relates to the physical repository (Database vs Knowledge base)

Question 1.2

Compare and contrast file systems with database management systems (DBMS). Discuss the following aspects:

(a) Data redundancy and its consequences

(b) Data anomalies (update, insertion, deletion)

(c) How DBMS addresses these file system limitations

Part 2

Based on the following business scenario, write comprehensive business rules and identify the relationships with their cardinalities:

Scenario: "Apple Music is a digital music streaming platform where artists upload their songs, users create playlists, and the system tracks listening statistics."

Write 8-10 formal business rule statements covering the main entities and relationships

Part 3

Design a complete Entity Relationship Diagram (ERD) for the following business scenario:

TechSkill Academy Training Management System

The TechSkill Academy has contacted you to create a conceptual model for their professional development training program. The academy administrator provides the following description of their operating environment:

Business Rules:

- TechSkill Academy has 15 certified instructors who can teach various technology courses

- The academy offers 8 different certification programs (Java, Python, Cloud Computing, etc.)

- Each certification program consists of multiple courses, with each program having a minimum of 3 courses and a maximum of 6 courses

- Each course has a course code, title, duration (in hours), difficulty level, and prerequisites

- Classes are scheduled instances of courses that can accommodate up to 25 students per class

- If a class has fewer than 8 students enrolled, it will be canceled

- Each class is taught by exactly one instructor, but an instructor may teach up to 3 classes simultaneously

- Each instructor has an instructor ID, name, specialization areas (multiple values), hire date, and certification level

- Students enroll in classes and have student ID, name, email, enrollment date, and current skill level

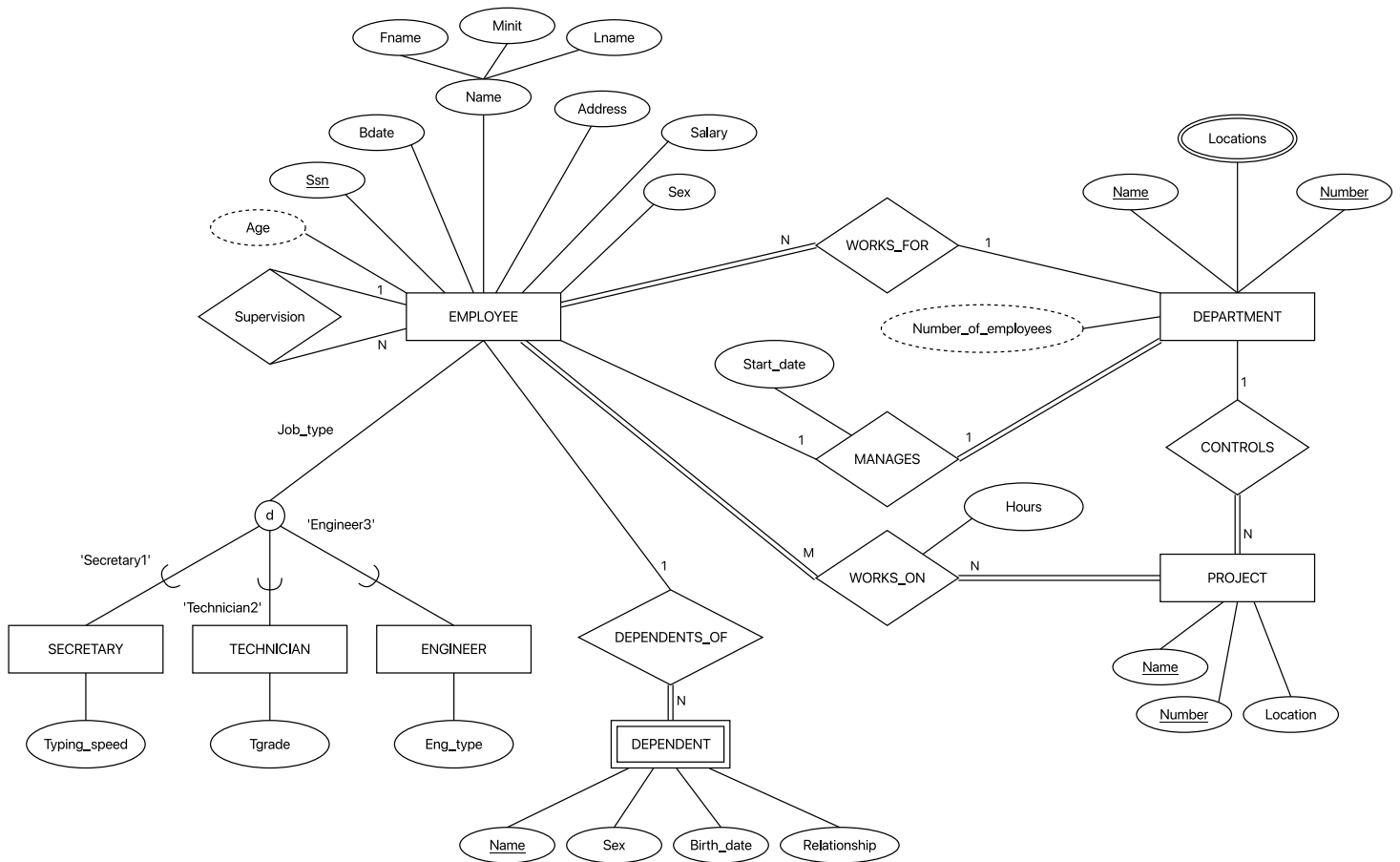- Each student can enroll in a minimum of 1 class and a maximum of 4 classes per semester

- The system tracks student performance with grades for each class (A, B, C, D, F)

- Students must complete assignments for each class, and each class has multiple assignments

- Each assignment has an assignment ID, title, description, due date, and maximum points

- The academy owns training equipment (laptops, servers, software licenses) that can be used across multiple classes

- Each equipment item has an equipment ID, name, purchase date, warranty expiration, and current status

- Instructors can request equipment for their classes, and the same equipment can be shared among classes

- Upon successful completion of all courses in a certification program, students receive certificates

- Each certificate has a certificate number, issue date, expiration date, and accreditation body

Bonus Opportunity: Add your own business rules that enhance the system without conflicting with the given requirements. Clearly note any additional rules you introduce.
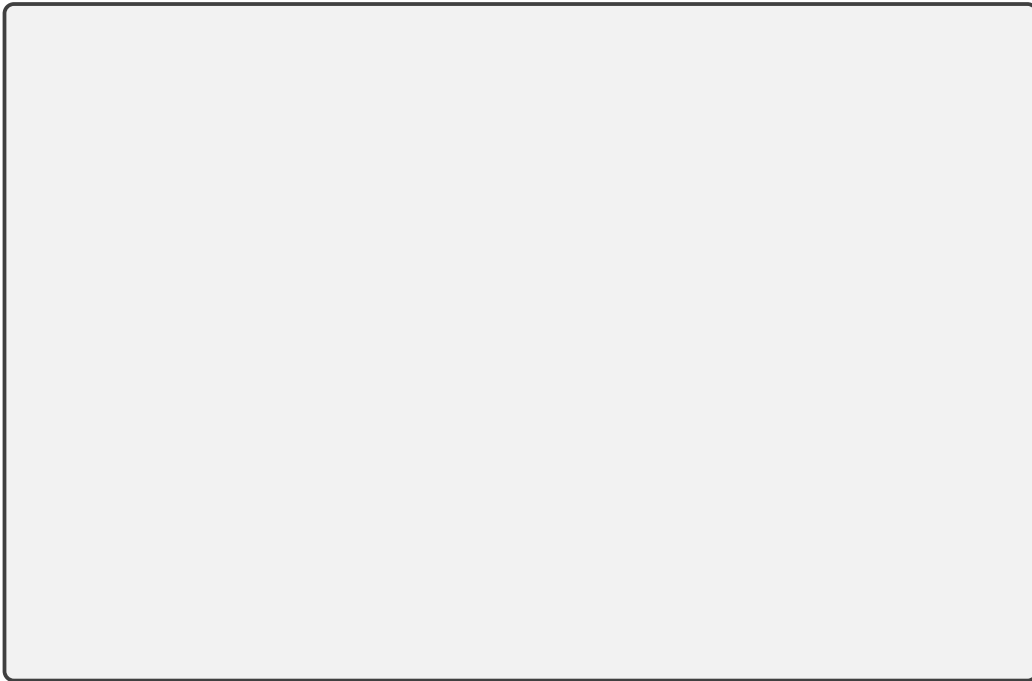
Draw here:

Part 4

Given the following ER diagram, transform them to relational tables using the 8-step algorithm:

Step 1:

Step 2:

Step 3: (Write "Not applicable" if none exist)

Step 4:

Step 5: (Write "Not applicable" if none exist)
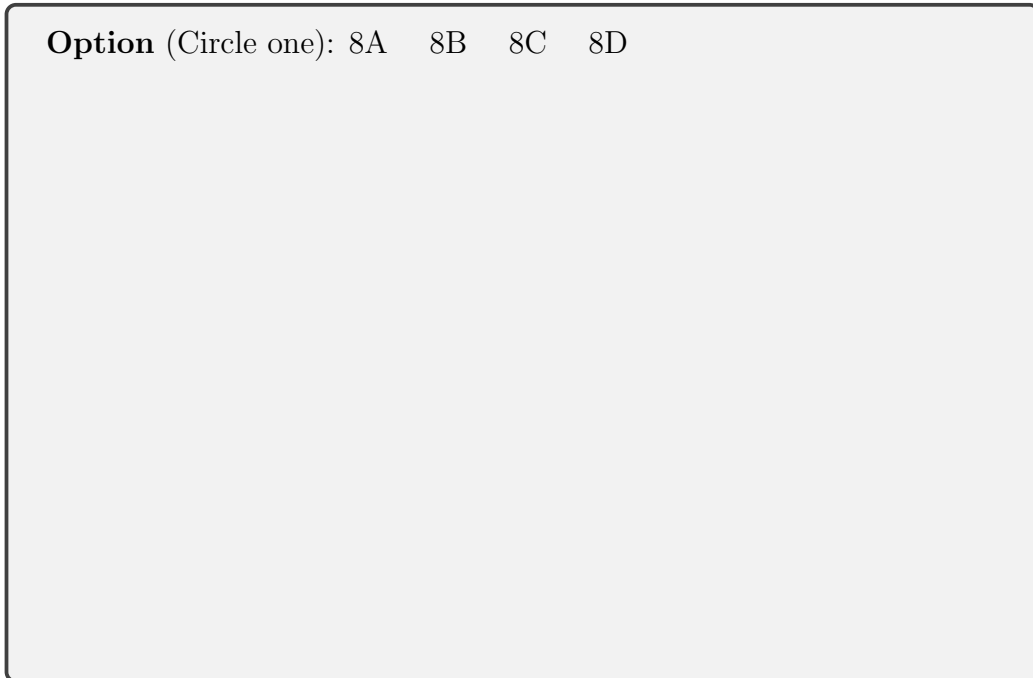
Step 6:

Step 7: (Write "Not applicable" if none exist)
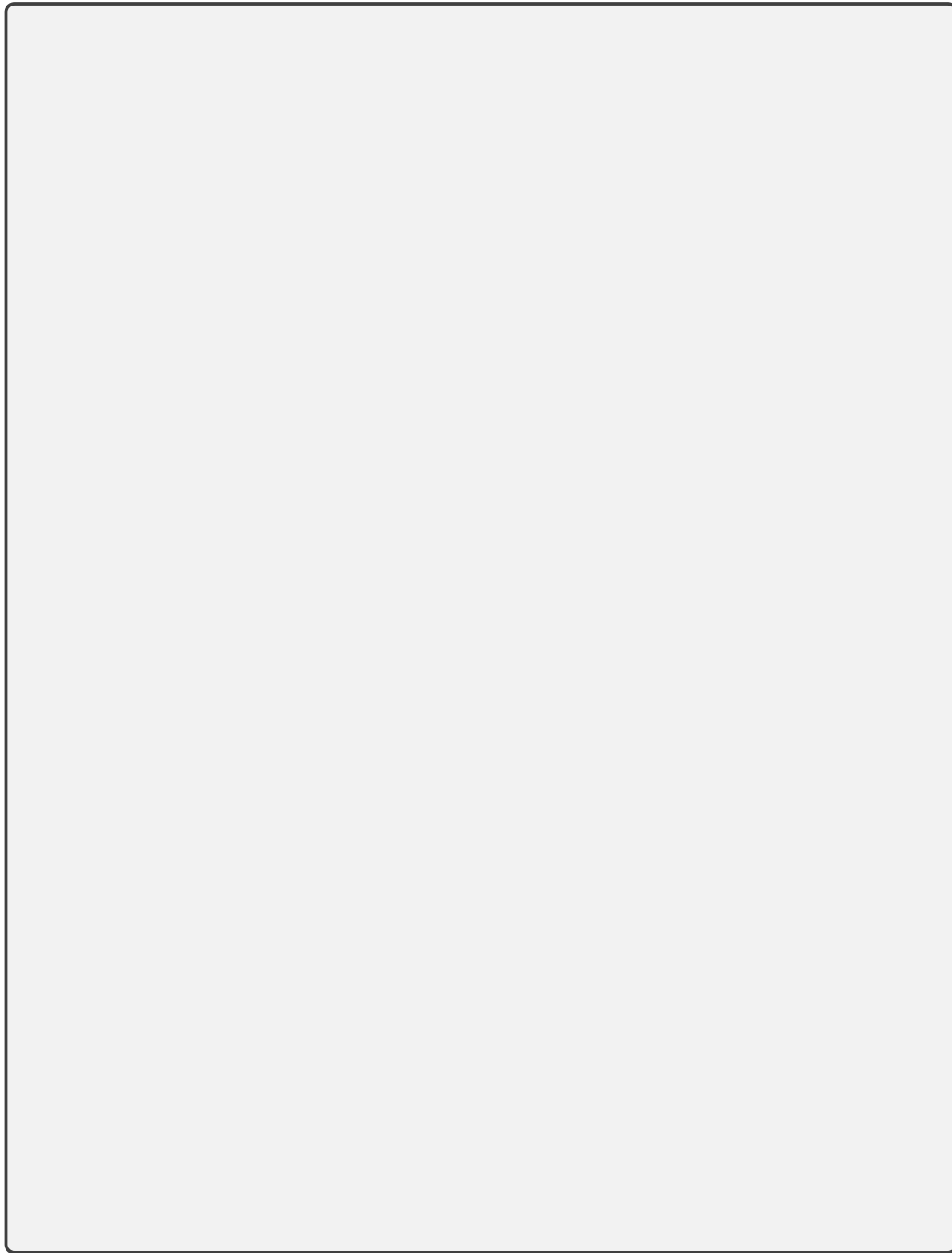
Step 8: (Write "Not applicable" if none exist)

Option (Circle one): 8A   8B   8C   8D

Final Relational Diagram:

Bonus Questions

Bonus 1

In the context of ternary relationships, explain why a relationship between STUDENT, PROFESSOR, and COURSE for "advising" might need to be ternary rather than decomposed into binary relationships. Provide a specific scenario where the ternary relationship captures information that binary relationships cannot.

Bonus 2

Describe the difference between the four specialization options (8A, 8B, 8C, 8D) for transforming generalization/specialization hierarchies to relational schemas. When would you choose each option?