COMP1531

Week 9 Tutorial!

Housekeeping

- milestone 3 due this Sunday
- practice exam - this week's lab
  - only attendance is marked
  - 40 mins

- MyExperience is out, please give feedback :)

[O]pen [C]losed [P]rinciple (OCP)

OCP

- Open for extension:
  - As requirements change, the behaviour of the class can be extended i.e. class can be extended with to behave in new and different ways to adapt to the changes
- Closed for modification:
  - Extending the behaviour of the module should not require changing the original source, or binary code of the module.

Example (bad)

```
class Car:

    def move(self):
        print("car moving..")
class Bike:
    def move(self):
        print("bike moving..")
class Traveller():
    def __init__(self):
        self._car = Car()

    def start_journey(self):
        self._car.move()

traveller = Traveller()
traveller.start_journey()
```

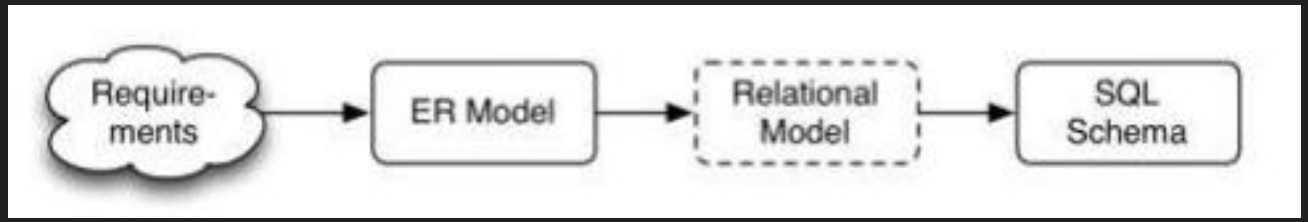
Example (improved)

```python
from abc import ABC, abstractmethod

class Vehicle(ABC):

    """
    @param: db contains database connection details
    """
    @abstractmethod
    def move(self):
        pass

class Car(Vehicle):

    def move(self):
        print("moving car")

class Bike(Vehicle):

    def move(self):
        print("moving bike")

class Traveller():

    """
    Injecting the vehicle type through the method
    """
    def start_journey(self, vehicle):
        vehicle.move()

traveller_1 = Traveller()
traveller_1.start_journey(Car())

traveller_2 = Traveller()
traveller_2.start_journey(Bike())
```

ER Diagrams

ER Diagram

- [E]ntity [R]elationship data modelling



- collection of interrelated entities.

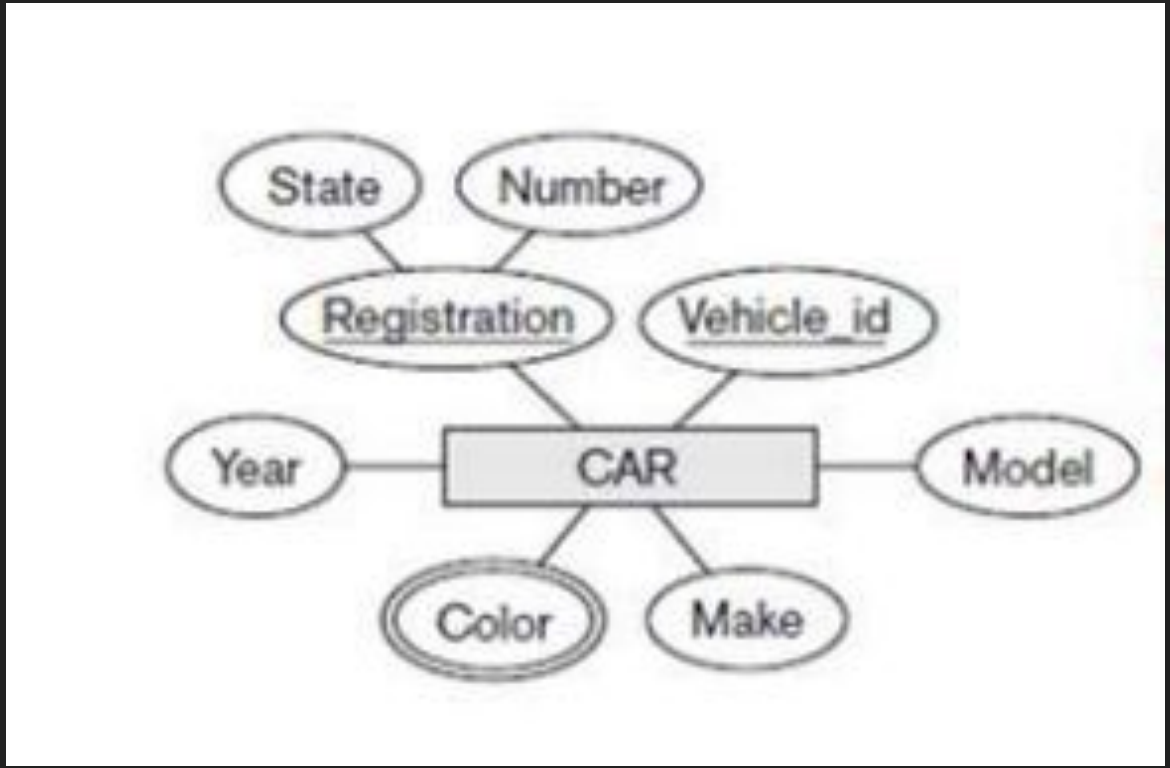
Components of ER diagram

- Entity - basically a thing of interest
- Attribute - a characteristic or property of interest
- Entity set - set of entities with the same attributes (analogous to *class* definition in OO)
- Key - consist attribute that is unique over the entity set

ER - Example

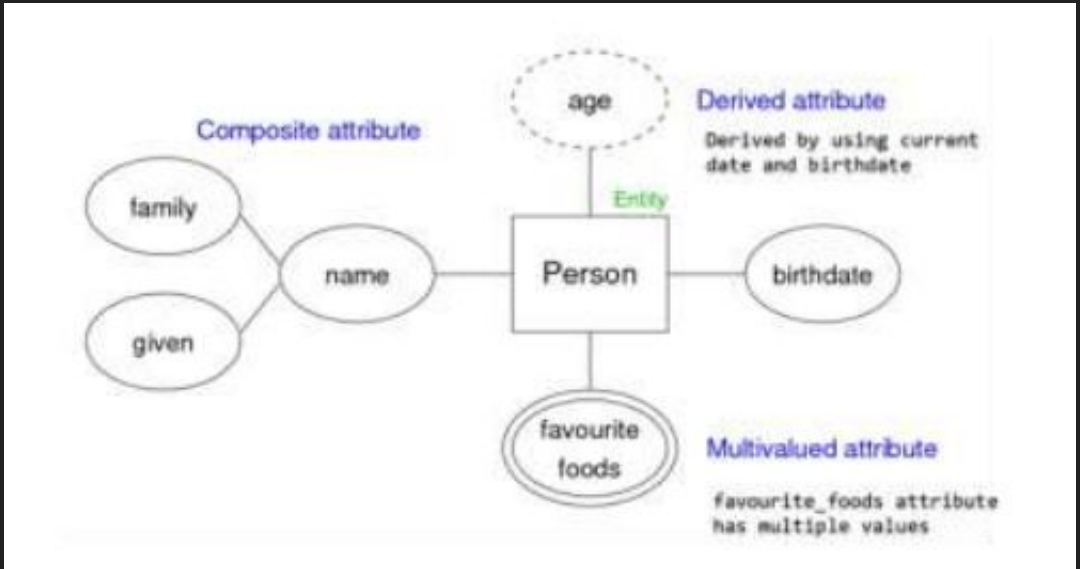
An Entity-set CAR with two key attributes (registration and vehicle_id), three single-valued attributes (year, model and make) and a multi-valued attribute (colour)

ER - Example (ans)



Other types of attributes

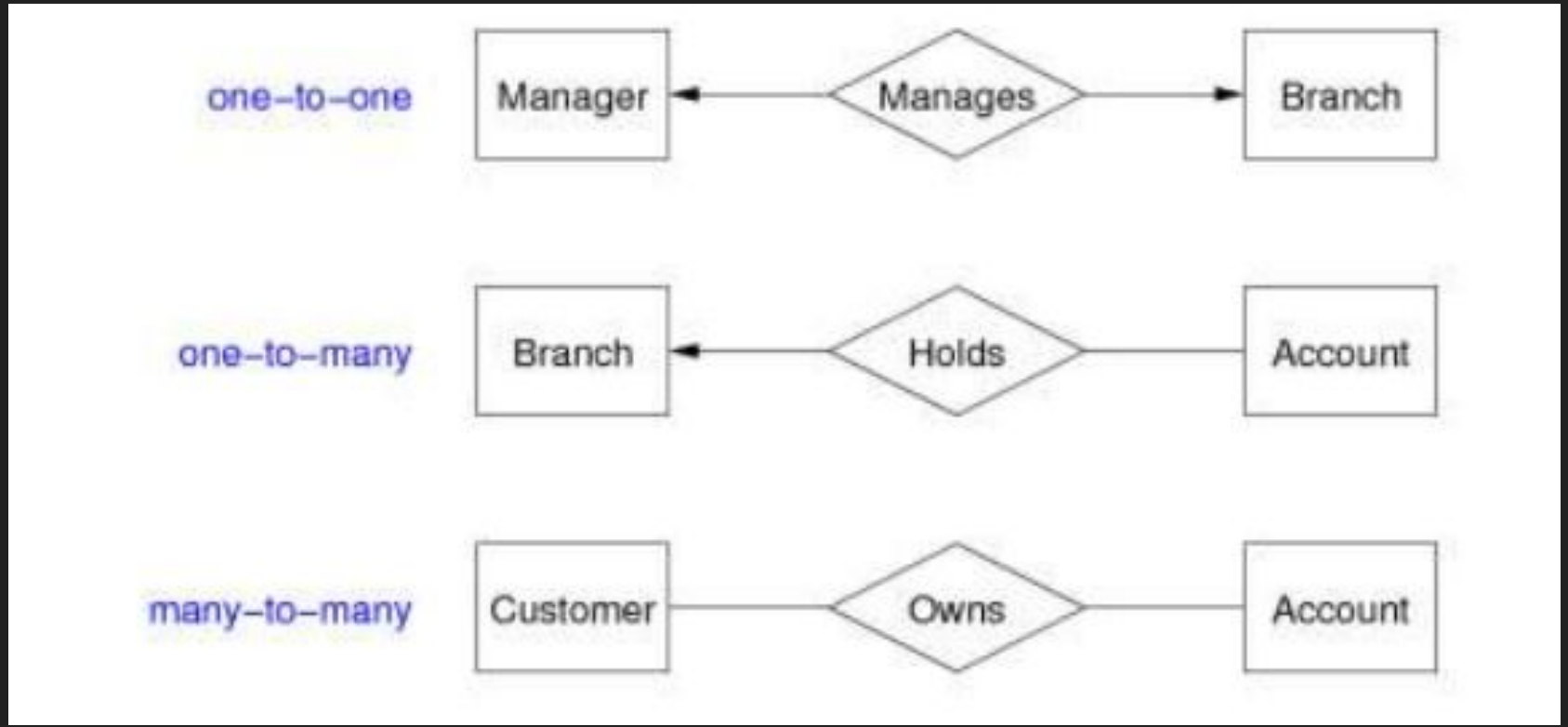
- Derived attribute
- Composite attribute



Relationships in ER Diagram

- relates two or more entities
  - student <is enrolled in> course
- degree of a relationship is the number of participating entities, mostly binary (degree = 2)
- cardinality - number of associated entities on each side of the relationship
  - one-to-one
  - one-to-many
  - many-to-many
  - *give example of manager, branch, account and customer*

Example (ans)


one–to–one
Manager
Manages
Branch
one–to–many
Branch
Holds
Account
many–to–many
Customer
Owns
Account

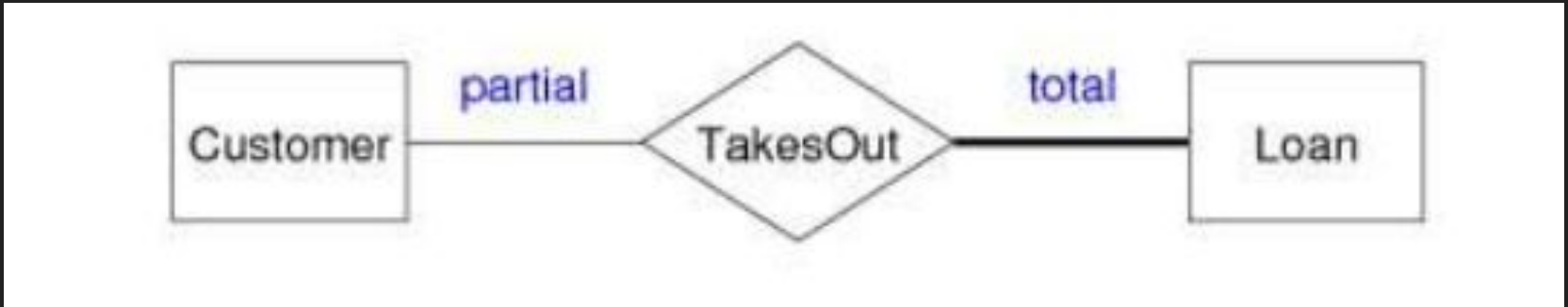
Level of Participation

- total - every a ∈ A participates in 1 or more relationships in R
- partial - only some a ∈ A participate in relationships in R

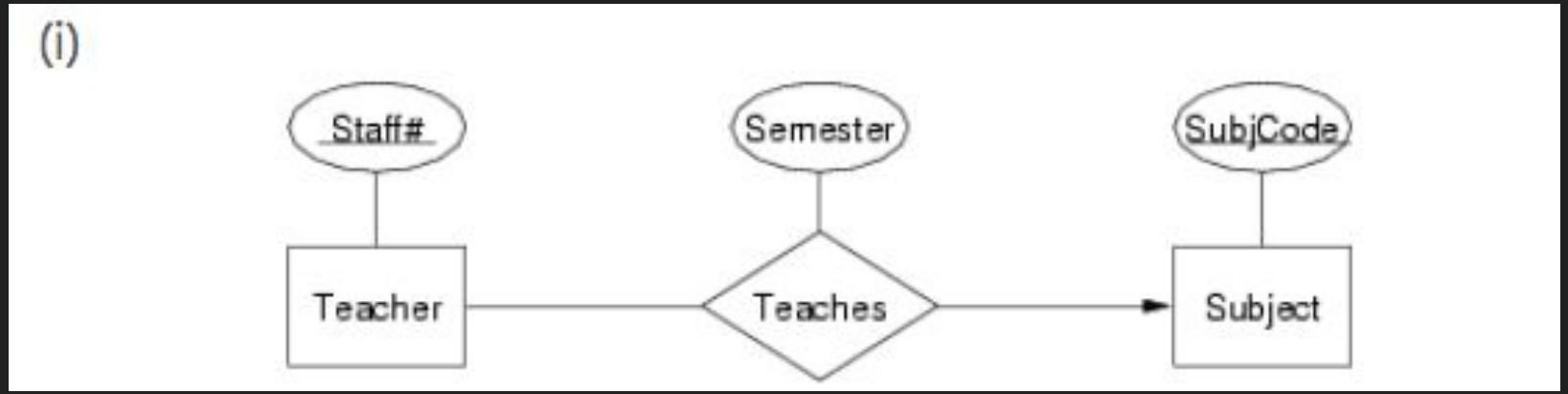
e.g.

- every bank loan is associated with at least one customer
- not every customer in a bank has a loan

Participation level (example)



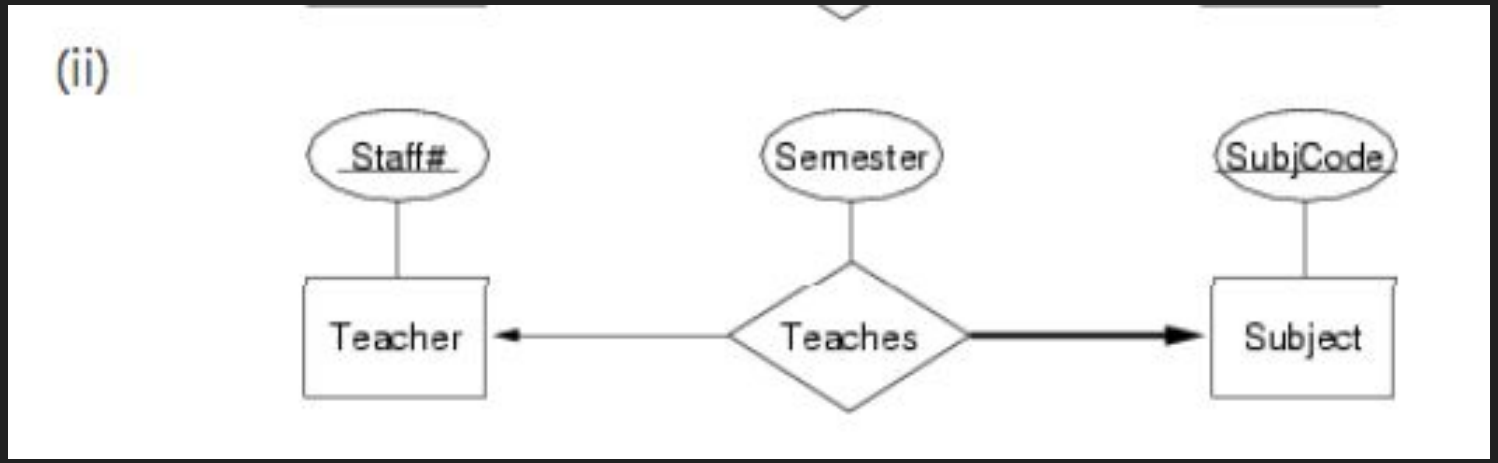
Exercise (1.1)



Exercise (1.1) - answer

- one to many
  - teacher can only teach one course
  - but a subject can be taught by many teachers
- partial participation
  - not every subject is assigned to a teacher
  - not every teacher is assigned to teach a subject

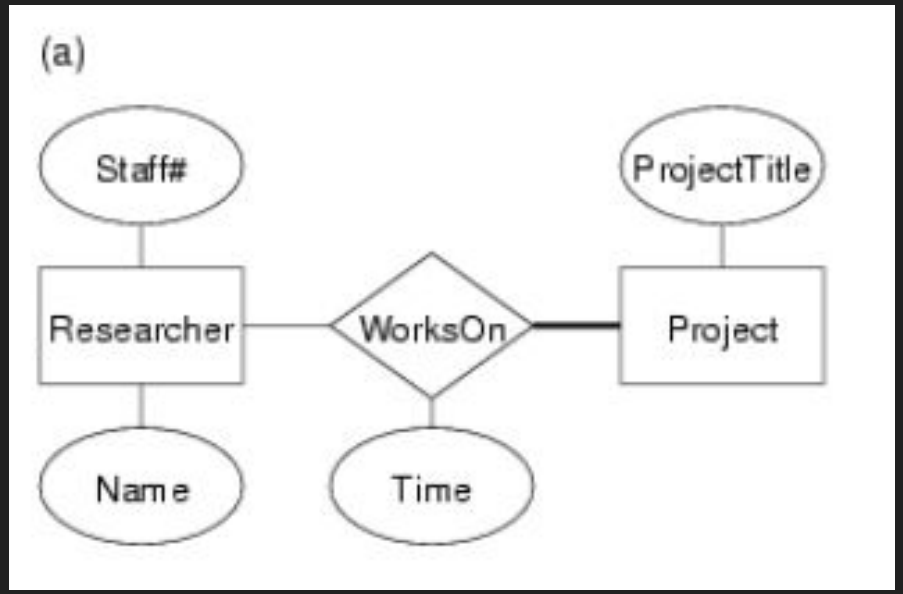
Exercise (1.2)



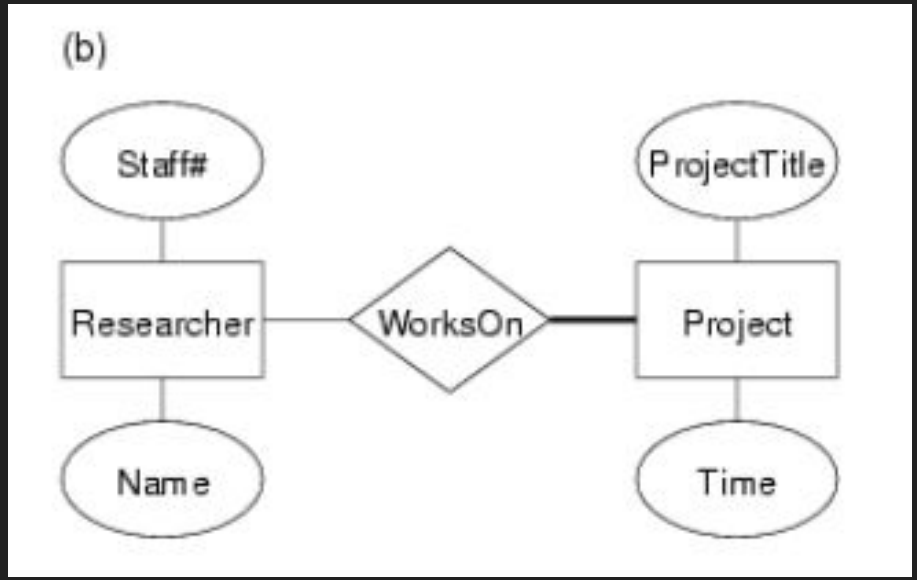
Exercise (1.2) - answer

- one-to-one
  - a teacher can only teach one subject and vice versa
- total participation on the subject entity side
  - a subject must be assigned to a teacher

Exercise (2.1)


(a)
Staff#
ProjectTitle
Researcher
WorksOn
Project
Name
Time

Exercise (2.2)


(b)
Staff#
ProjectTitle
Researcher
WorksOn
Project
Name
Time

Answer

a. the Time attribute is attached to the WorksOn relationship
    i. models time that each researcher spends on each project that they are involved with
b. the Time attribute is attached to the Project entity
    i. measures the total time allocated to the project

Both:

- every project must have at least one researcher
- not every researcher needs to work on a project