SECTION A: True or False. Write "T" for True and "F" for False in the first column. For the false statement(s), underline the word(s) that is/are wrong and rewrite it/them so that the statement becomes true; simply adding a "not" to negate a sentence is not allowed.
(Total: 30 marks; 2 marks for each correct answer)

T ✗	1.	A strong entity cannot exist in the database unless another type of entity also exists in the database.
T ✗	2.	A view corresponds to a named relation in the conceptual schema, whose tuples are physically stored in the database.
F ✓	3.	<u>External</u> level describes what data is stored in the database and the relationships among the data. Internal
T ✓	4.	Database approach does not eliminate redundancy entirely, but controls the amount of redundancy.
T ✓	5.	Eliminating or controlling redundancy can reduce the risk of inconsistencies.
F	6.	There is at least one <u>foreign</u> key for each relation. candidate
F ✗	7.	Relations that are in <u>1NF, 2NF and 3NF</u> and with every determinant being candidate key are normalized into BCNF as well. 3NF
T ✓	8.	A subclass can have its own subclasses.
F ✗	9.	An optional participation constraint specifies that a member of a superclass <u>needs</u> not belong to any of its subclasses. may
F ✓	10.	There is one <u>and only one</u> candidate key for each relation. or more
T ✗	11.	Disjoint constraint can be mandatory or optional.

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2	T	12. Each member of a subclass is also a member of the superclass.
2	T	13. A view permits users to access data in a customized way, so that the same data can be seen by different users in different ways, at same time.
1	F	14. A ternary relationship is so called because it contains <u>two</u> entities and one association between them. four 3
2	T	15. In a relation, the order of the columns does not matter.

SECTION B: Multiple Choice: Write the letter that best describes the statement in the first column.
(Total: 22 marks; 2 marks for each correct answer)

~~D~~	16. Which of the following is not true about a view? (A) Corresponding to a named relation in the conceptual schema, whose tuples are physically stored in database. (B) Dynamic result of one or more relational operations operating on base relations to produce another relation. (C) A virtual relation that does not necessarily exist in the database. (D) Contents are defined as a query on one or more base relation.
A	17. If no multi-valued attributes exist in a relation, in what normal form is that relation? (A) First normal form (B) Second normal form (C) Third normal form (D) BCNF
~~C~~	18. What schema defines how and where the data are organized in physical data storage? (A) External schema (B) Internal schema (C) Conceptual schema (D) None of the above
~~A~~	19. The top-down database design approach starts at the _____. (A) fundamental level of attributes (B) development of data models that contain high-level abstractions (C) identification of the set of major entities (D) none of the above
B	20. The conceptual database design is the process of _____. (A) deriving the physical nature of the database (B) identifying the important entities, relationships, and attributes (C) analyzing overall data requirements (D) none of the above
C	21. An attribute having multiple values for each occurrence of an entity type is called a(n)_____. (A) composite key (B) composite attribute (C) multi-valued attribute (D) none of the above
~~D~~	22. The entity integrity rule states that _____. (A) no primary key attribute may be null (B) no primary key may be equal to a value in a foreign key (C) every primary key must have a matching value in a foreign key (D) every foreign key must have a matching value in a primary key

B ✗	23. Which of the following data constraint is used to specify that the value of the cells in a column must be one of a specific set of possible values? (A) Domain constraint (B) Referential constraint (C) Entity constraint (D) Range constraint
B	24. A tuple is a(n) _____. (A) column of a table (B) row of a table (C) two-dimensional table (D) key of a table
C	25. Which of the following is not a restriction for a table to be a relation? (A) The cells of the table must contain a single value. (B) All of the entries in any column must be of the same kind. (C) The columns must be ordered. (D) No two rows in a table may be identical.
A	26. A recursive relationship is a relationship between an entity and _____. (A) itself (B) a subclass entity (C) a parent entity (D) a child entity

SECTION C: Answer the following questions. (Total: 48 marks)

27. Name the three stages of database design. **[6 marks]**

Top-down ~~database~~ design

Conceptual ~~database~~ design

28. In enhanced entity-relationship model, what is the difference between specialization and generalization? **[6 marks]**

29. Create an entity-relationship (ER) model for each of the following descriptions. Represent all the ER models in parts (a), (b), (c) and (d) as a single ER model. Provide any assumptions necessary to support your model. **[16 marks]**

   a) A DOCTOR writes zero or more PRESCRIPTION(S). Each doctor has a unique ID, name, and speciality.

   b) A PATIENT may receive zero or more PRESCRIPTION(S). Each patient has a unique number, name, telephone number, and date of birth.

   c) A DRUG may appear in zero or more PRESCRIPTION(S) (To simplify this example, assume that the business rule states that each prescription contains only one drug. In short, if a doctor prescribes more than one drug, a separate prescription must be written for each drug.). Each drug has a unique drug code, name, and price.

   d) Each prescription has a unique number.

Doctor (ID, name, speciality)

Patient (number, name, telephone number , birth)

Drug (drug code , name, price)

Prescription (number)
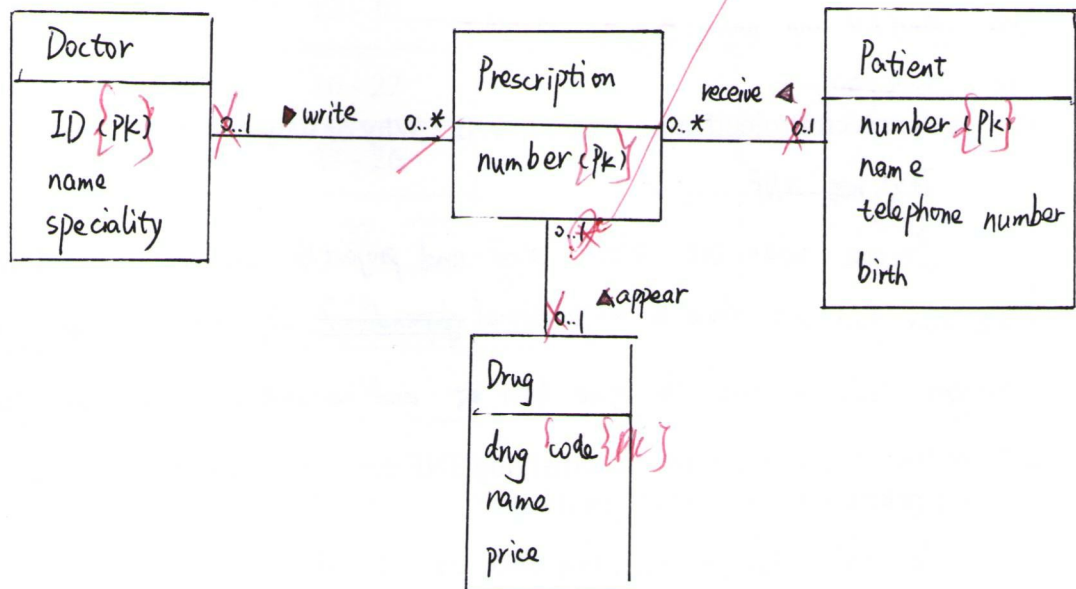
30. A company keeps track of the time spent on a project by each staff. Below is an instance of this ProjectData relation.

ProjectData

staffID	projectNo	projectBudget	timeSpent
P1	PROJ1	20	20
P2	PROJ1	20	83
P2	PROJ2	17	35
P2	PROJ3	84	42
P3	PROJ1	20	16
P3	PROJ2	17	17
P4	PROJ3	84	41

30.1 List out all the functional dependencies of the given ProjectData relation. [6 marks]

According to the table, the functional dependencies are:

projectNo → projectBudget ✓

projectBudget → projectNo ✗

timeSpent → staffID, ~~proj~~ projectNo, projectBudget. ✓

30.2 Identity the candidate key(s) of the given ProjectData relation. [3 marks]

According to the table, the candidate keys can be:

staffID and projectNo together.

~~or staffID and projectBudget together,~~

or timeSpent.

30.3 Is the given ProjectData relation in 2NF? Why or why not? [5 marks]

It's not 2NF.

Because when we select "staff and projectNo together" as primary key.

we can find that there is a functional ~~dependencie~~ dependency "projectNo → projectBudget".

to get 2NF, we need to move them out and ~~sa~~ create a new table for them.

30.4 Write the resulting relations satisfying 3NF derived from ProjectData relation, indicating the primary key as well. [6 marks]

The table has no repeating data so it's 1NF

1NF→2NF: ProjectData (_staffID, projectNo_, projectBudget, ~~Time~~ timeSpent)

staffID → (No)

projectNo → projectBudget

2NF: ProjectData (_staffID, projectNo_, timeSpent)

Project (_projectNo_, projectBudget)

2NF→3NF: The relations in 2NF have no transitive dependencies, so the 3NF is actually the same as 2NF table.

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