March/April 2010 Test 1
Question 1 (8)
Modified True/False
Indicate whether the sentence or statement is true or false. If false, change the identified word or phrase to make the sentence or statement true.

1.1 Durability requires that all operations of a transaction be completed**. __F** ***Atomicity***

1.2 Atomicity indicates the permanence of the database's consistent state**. ___F** ***Durability***

1.3 Serializability means that data used during the execution of a transaction cannot be used by a second transaction until the first one is completed**. ___F** ***Isolation***

1.4 Consistent retrievals occur when a transaction calculates some summary functions over a set of data while other transactions are updating their data**. __F** ***inconsistent _***

1.5 A(n) **page**-level lock prevents access to a row by a second transaction while the table is being accessed by the current transaction**. _____F _*Table***

1.6 Locking can take place at any of the following levels: database, table, page, row, or field. _____T

1.7 Database **backup** restores a database from an inconsistent state to a previously consistent state. _____F ***Recovery***

1.8 Concurrency control is the management of concurrent transaction execution. _____T

Question 2 (18) Multiple Choice
*Identify the letter of the choice that **best** completes the statement or answers the question.*

2.1. Another word for existence-independent is ____.
a. weak c. unary
b. alone **d.** strong

2.2. When the PK of one entity does not contain the PK of a related entity, the relationship is ____.
a. missing c. strong
b. weak d. neutral

2.3. The term "____" is used to label any condition in which one or more optional relationships exist.
a. participation c. cardinality
b. optionality d. connectivity

2.4. The ERD is used to graphically represent the ____ database model.
a. condensed c. logical
b. physical **d.** conceptual

2.5. Some attributes are classified as ____.
a. simple c. defined
b. complex d. grouped

2.6. Cardinality expresses ____ number of entity occurrences associated with one occurrence of the related entity.

a. an undetermined c. a pre-determined
b. the specific d. a programmed

2.7. A ____ attribute can be further subdivided to yield additional attributes.

a. composite c. single-valued
b. simple d. multivalued

2.8. A ____ entity has a primary key that is partially derived from the parent entity in the relationship.

a. strong c. business
b. weak d. relationship

2.9 The set of possible values for an attribute is a ____.

a. domain c. set
b. range d. key

2.10. Which of the following should not be placed in a relational table?

a. Entity c. Relationship
b. Attribute **d.** Repeating group

THE NEXT 8 SUBQUESTIONS WILL BE DELETED ??

11 All transaction properties must display ____.

a. atomicity, serializability, and durability
b. durability and isolation
c. serializability, durability, and isolation
d. atomicity, durability, serializability, and isolation

12 Lock ____ indicates the level of lock use.

a. granularity c. growing
b. shrinking d. serializability

13 A transaction that changes the contents of the database must alter the database from one ____ state to another.

a. consistent c. independent
b. dependent d. inconsistent

14 When is the implicit beginning of a transaction?

a. When the database is started
b. When a table is accessed for the first time
c. When the first SQL statement is encountered
d. When the COMMIT command is issued

15 The ____ approach is based on the assumption that the majority of the database operations do not conflict.

a. default c. scheduled
b. basic **d.** optimistic

16 ANSI defines four events that signal the end of a transaction. Which of the following events is defined by ANSI as being equivalent to a COMMIT?

a. Five SQL statements are executed.
b. The end of a program is successfully reached.
c. The program is abnormally terminated.

d. The database is shut down for maintenance.

17 The relationship between a supertype and a subtype is:
a. 1-Many
b. Many-Many
c. Weak
d. 1-1

18 The Lost Update problem cannot occur if we have:
a. Atomicity
b. Isolation
c. Durability
d. Optimistic Locking

Question 3 (30)

3.1 Construct an **Extended Entity Relationship model** diagram for the following problem. A Pharmacy in a hospital has a database in which is stored prescriptions for various patients, amongst other objects. The prescription can contain several lines, and each line refers to a quantity of a given medicine which is prescribed and the extended cost. Associated with each prescription is the doctor who gave the prescription, the date and whether the prescription has been partially or wholly filled. Associated with each medicine is the medicine-number, name, unit cost and the quantity in stock at that pharmacy. We record data for each doctor, like doctor_phone_no.

The Pharmacy orders fresh supplies from a Supplier, who must either be a Pharmaceutical Company type or a Wholesale Pharmacy type . A Supplier is identified by Supplier-No and has a Supplier name, email and phone number and a Supplier type discriminator. A Pharmaceutical Company has a Managing Director and Wholesale Pharmacy has a Chief Pharmacist. Your database must keep a record of all purchase orders to suppliers as well.

Make sure that you indicate weak/strong relationships, connectivity and optionalities as well as primary keys and foreign keys. You do not need to include all attributes, only major attributes to make sure your EERD is meaningful. You must also show completeness and disjoint/overlapping attributes for any supertype/subtypes.

You may use UML notation or Crow's Foot (Visio) notation . (22)

3.2 Give the Relations with their keys for the above database (use table shorthand notation). (8)

ANSWER: 3.1 Entities 7 (with correct primary keys)

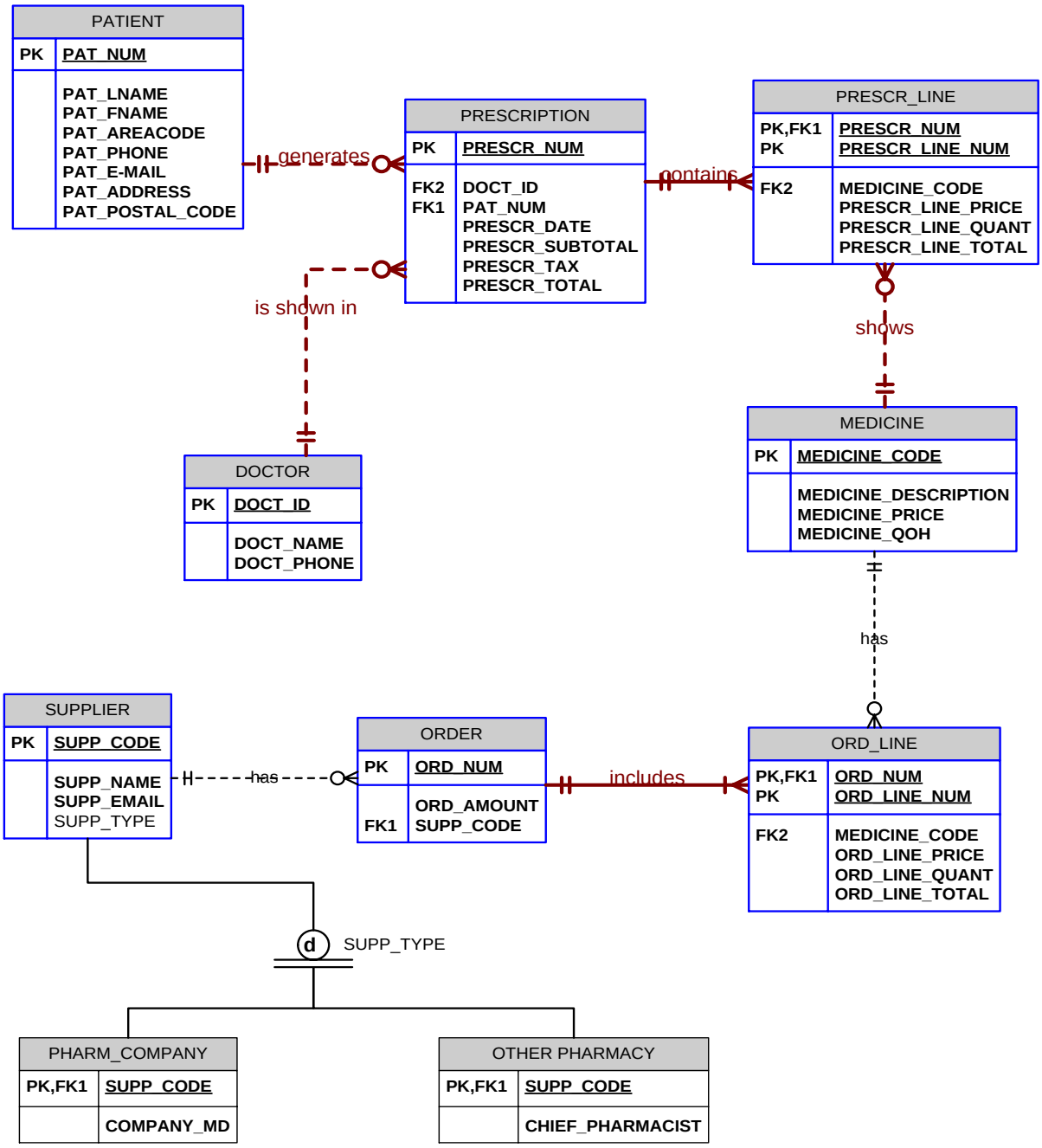
Relationships (indicated by lines, correct connectivity, and foreign keys) 6

Strong/Weak relationships 2

Cardinalities 2

Supertype/Subtypes 3

3.2 Obvious from Diagram below – will be marked separately on own merit 1 per correct table with all keys.



Question 4 (8)

Concurrency control is important because the simultaneous execution of transactions over a shared database can create several data integrity and consistency problems. The three main problems are lost updates, uncommitted data, and inconsistent retrievals.

Use an example (diagram) to explain the problem of lost updates and briefly explain your diagram (8)

ANSWER Must explain in full

TABLE 10.3 Lost Updates

TIME	TRANSACTION	STEP	STORED VALUE
1	T1	Read PROD_QOH	35
2	T2	Read PROD_QOH	35
3	T1	PROD_QOH = 35 + 100	
4	T2	PROD_QOH = 35 − 30	
5	T1	Write PROD_QOH (**Lost update**)	135
6	T2	Write PROD_QOH	5

Question 5 (14)

5.1 Explain what deadlock is. (3)

5.2 Explain the concept of timestamping to solve concurrency problems. (3)

5.3 Describe the Wait/Die and Wound/Wait schemes for avoiding concurrency problems and deadlock. Illustrate with a diagram. (8)

TOTAL MARKS **[70]**

5.1 Solution

Condition that occurs when two transactions wait for each other to unlock data

Possible only if one of the transactions wants to obtain an exclusive lock on a data item

- No deadlock condition can exist among shared locks

5.2 Solution

Assigns global unique time stamp to each transaction

Produces explicit order in which transactions are submitted to DBMS etc.

Solution to 5.3

TABLE 10.12 Wait/Die and Wound/Wait Concurrency Control Schemes

TRANSACTION REQUESTING LOCK	TRANSACTION OWNING LOCK	WAIT/DIE SCHEME	WOUND/WAIT SCHEME
T1 (11548789)	T2 (19562545)	• T1 waits until T2 is completed and T2 releases its locks.	• T1 preempts (rolls back) T2. • T2 is rescheduled using the same time stamp.
T2 (19562545)	T1 (11548789)	• T2 dies (rolls back). • T2 is rescheduled using the same time stamp.	• T2 waits until T1 is completed and T1 releases its locks.