NAME OF STUDENT: _____	**Lecturer: Amlan Mukherjee** **Marlon Parker**
STUDENT NUMBER:	**Group:** _____

SUBJECT **INFORMATION SYSTEMS III (Databases) FT**	**DATE** 17th MARCH 2011 **TIME** 13:00	**TIME** 2 Hours **FULL MARKS** 90

Cape Peninsula University of Technology

FACULTY OF INFORMATICS & DESIGN

COURSE(S): ND: INFORMATION TECHNOLOGY

EXAMINER: _____ **MODERATOR:**_____

(MR A MUKHERJEE) **(**MR M PARKAR)

REQUIREMENT

- **NONE**

SPECIAL INSTRUCTIONS:

- **Answer all the questions.**
- **All answers must be written in the space provided in the Question Paper.**
- **Answers should be brief and to the point.**

Question 1 **(10)**

Indicate whether the sentence or statement is true or false.

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

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

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**.**

1.4 Using the **timestamp** protocol for concurrent transaction can lead to **deadlock**.

1.5 **Binary** locks can be only two types.

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

1.7 A Database cannot be restored using only the **Log** files.

1.8 The **foreign key** maintains the referential integrity of a database.

1.9 **Weak Entity** can have a primary key.

1.10 **Generalization** is used to avoid unnecessary null.

1.1	**1.2**	**1.3**	**1.4**	**1.5**
1.6	**1.7**	**1.8**	**1.9**	**1.10**

Question 2 Multiple Choice **(10)**

Fill in the blanks using the options given below. Please answer in the space provided not in the the questions.

1. A DBMS uses ____ to keep track of all transactions that update the database.
2. The problem of **uncommitted data** violates the _____ property of a transaction.
3. ___ is a special program in DBMS which takes care of the execution of transactions.
4. A shared lock can also be called a _____
5. ___ is the phase of a transaction when it acquires lock on Data items in 2PL.
6. ___ is the operation in which the database writes all the updated buffers to disk.

7. ___ ensures that the Timestamp values of a transaction always increase.

8. __ is the process where transactions are allowed to run in parallel but the effect in the database should be same as if they were executed in serial.

9. One problem of 2 phase locking protocol is _____

10. A temporary storage area in the memory used to speed up database operation is _____

a> Durability
b> Transaction Logs
c> Isolation
d> Monotonicity
e> Scheduler
f> Deadlock
g> Lock Manager
h> Read Lock
i> Write Lock
j> Databas Buffers
k> CheckPoint
l> Shrinking Phase
m> Growing Phase
n> Serializability

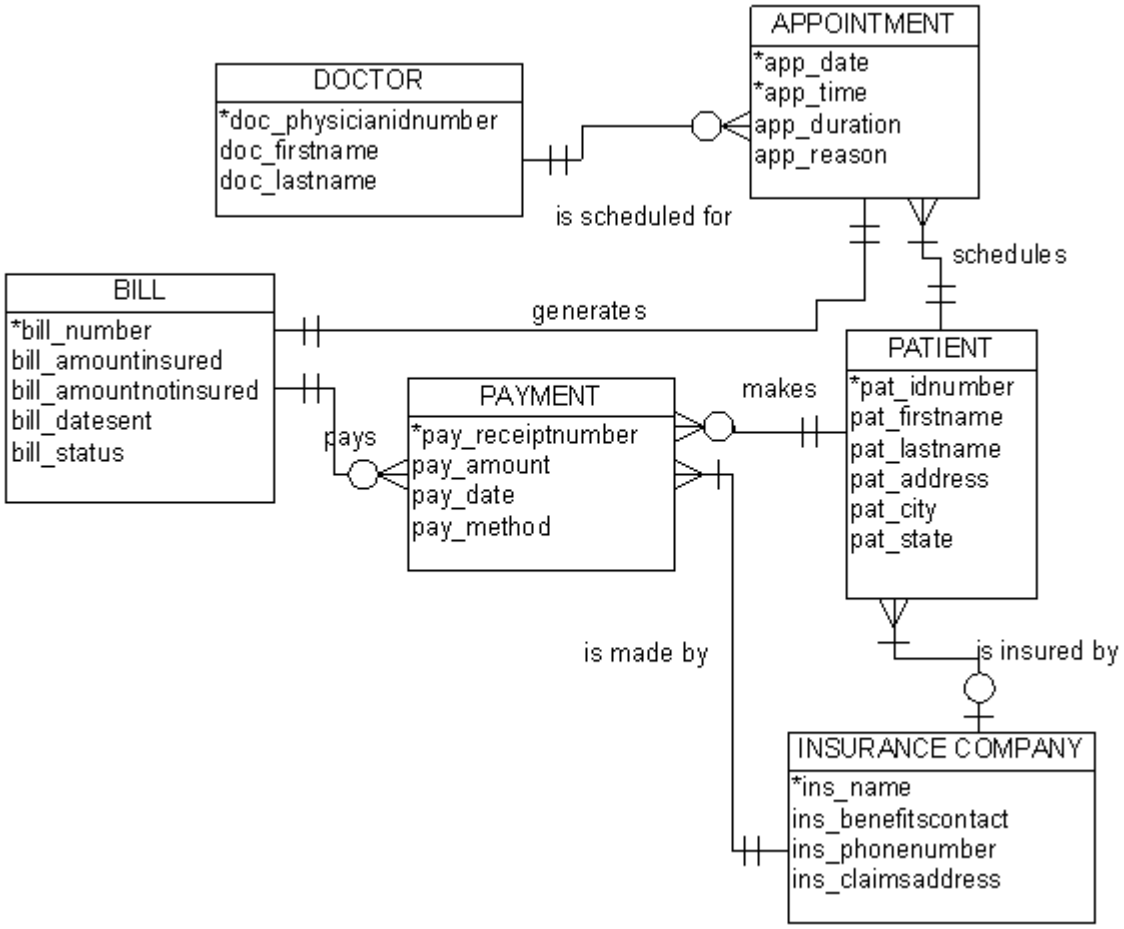
Answer:
1 →
2 →
3 →
4 →
5 →
6 →
7 →
8 →
9 →
10 →

Question 3 **(30)**

Consider the following:

A doctor can be scheduled for many appointments, but may not have any scheduled at all. Each appointment is scheduled with exactly 1 doctor. A patient can schedule 1 or more appointments. One appointment is scheduled with exactly 1 patient. An appointment must generate exactly 1 bill, a bill is generated by only 1 appointment. One payment is applied to exactly 1 bill, and 1 bill can be paid off over time by several payments. A bill can be outstanding, having nothing yet paid on it at all. One patient can make many payments, but a single payment is made by only 1 patient. Some patients are insured by an insurance company. If they are insured, they can only carry insurance with one company. An insurance company can have many patients carry their policies. For patients that carry insurance, the insurance company will make payments; each single payment is made by exactly 1 insurance company.

The ER diagram of the scenario is as follows:



Check the ER Diagram and convert it into a database schema (List of Tables corresponding to the ERD)

Table Name	Number of Attribute	Primary Key	Foreign Key(s)
(6)	**(6)**	**(6)**	**(12)**

Question 4 **(10)**

Critically comment on the following statements:
(You may agree or disagree with the statement provided. Please provide reason for your opinion within the space provided. Please don't just write the definition of the terms used in the statement.)

4.1> " Specialization are used mainly to avoid NULL values in the database"
(5)
4.2> " Differential backup makes the system faster for recovery"
(5)

Question 5 **(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.

Suppose there are 2500 toothpaste left in a Pick-n-Pay store. An assignment of 200 more toothpaste more has arrived. The manager wants to update the stock level through a transaction T1. At the same time one lady is buying 10 toothpastes from a till. The client machine in that till runs another transaction T2 for the selling operation.
The data item which stores the quantity of stock for Toothpaste is TP_QOH.

4.1 Which category will the problem fall out of the above mentioned 3 main problems of simultaneous execution of transaction? **(2)**

4.2 Fill up the third column of the following table for the above transactions (Only for the read and write operations): **(4)**

Time	Transaction	Step	Stored Value
1	T1	Read TP_QOH	
2	T2	Read TP_QOH	
3	T1	TP_QOH = TP_QOH + 200	
4	T2	TP_QOH = TP_QOH – 10	
5	T1	Write TP_QOH	
6	T2	Write TP_QOH	

4.3 Briefly explain the above problem and suggest a solution for the problem. **(4)**

Category	**(2)**
Explanation	**(2)**
Possible Solution	**(2)**

Question 6 **(10)**

6.1> What problem can occur while using 2 phase locking protocol.

(1)

6.2> Write down the name of the three techniques used to deal with the problem.

(1)

6.3> Briefly discuss any two of them.

(3)

(3)

6.4> What do mean by checkpoints in database?

(2)

Question 7 **(10)**

There are two transactions in the system namely T1 and T2 having Timestamps 10 and 20. Fill up the operation that the DBMS will perform for the following scenario. (8)

Transaction Requesting Lock	Transaction Owning Lock	Wait / Die Scheme	Wound / Wait scheme
T1	T2		**(4)**
T2	T1		**(4)**

TOTAL MARKS **[90]**

SCORES

QUESTION	MARKS
1	/ 10
2	/ 10
3	/ 30
4	/ 10
5	/ 10
6	/ 10
7	/ 10

TOTAL

/ 90

PERCENTAGE

**** END OF TEST****