

BACHELOR OF INFORMATION TECHNOLOGY ENGG. EXAMINATION, 2018
 2nd year, 1st semester
Database Management Systems

Time: 3 Hours

Marks: 100

Note: Answer question 1 and any five from the rest. Answer should be brief and to the points.

1. (i) What are the disadvantages of file processing system?
 (ii) What is conceptual schema?
 (iii) What are stored and derived attributes?
 (iv) What is meant by lossless-join decomposition?
 (v) What are the two types of serializability?
 (vi) What is intention mode locking?
 (vii) What is Write Ahead Logging?
 (viii) Why are many nulls in a relation considered bad?
 (ix) Which are the various reasons for a transaction to fail?
 (x) Which recovery techniques do not require rollback?
(2x10)

2. (a) What do you mean by Insertion Anomaly? Give one example.
 (b) What is the dependency preservation property for decomposition? Why is it important?
 (c) What is meant by the closure of a set of functional dependencies?
 (d) Consider the universal relation $R = \{A, B, C, D, E, F, G, H, I, J\}$ and the set of functional dependencies
 $F = \{AB \rightarrow C, A \rightarrow E, B \rightarrow F, D \rightarrow B, F \rightarrow GH, D \rightarrow IJ\}$.
 What is the key for R? Decompose R into 2NF, then 3NF relations.
(3+4+3+6)

3. (a) What is a transaction? Explain properties of a transaction with the help of an example.
 (b) Discuss the actions taken by the read_item and write_item operations on a database.
 (c) At the time of transaction processing why Concurrency is needed?
 (d) Explain Serial and Non-serial schedules with examples.
(2+4+4+2+4)

4. (a) Consider the following relational schema.
Employee (empno, name, office, age)
Books (isbn, title, authors, publisher)
Loan (empno, isbn, date)
 Write the following queries in relational algebra.
 (i) Find the names of employees who have borrowed all books Published by McGraw-Hill.
 (ii) Find the names of employees who have borrowed more than five different books published by McGraw-Hill.
 (iii) For each publisher, find the names of employees who have borrowed more than five books of that publisher.

- (b) What are the steps involved in query processing?
- (c) How do you measure the cost of query evaluation?
- (d) Give the optimized query tree, corresponding to the query: Question 4(ii). (3x2+3+2+5)

5. (a) In respect of phases of two-phase locking protocol, Define upgrade and downgrade?
- (b) Explain multi-version concurrency control techniques.
- (c) What is deadlock? Draw a wait-for graph for the following schedule and try to find out if there is any deadlock in the system or not.

T1	T2	T3	T4	T5
Read(X)				
			Read(Z)	
	Read(Y)			Read(Z)
Write(X)			Read(X)	
	Read(X)			
		Read(Z)		
			Write(X)	
		Write(Z)		
Read(Y)		Read(X)		
				Read(Y)
Write(Y)				

(3+6+2+5)

6. (a) Write about the deferred update recovery techniques.
- (b) Describe the shadow paging recovery technique. Under what circumstances it does not require a log?
- (c) A DBMS that uses immediate updates has the following log entries:

```

<T0 start>
<T0, A, 0, 150>
<T1 start>
<T1, B, 10, 110>
<T2 start>
<T2, C, 10, 100>
<T0 commit>
<T2, C, 100, 120>
<checkpoint {T1, T2}>
<T3 start>
<T1 commit>
<T4 start>
<T3, A, 150, 20>
<T3, D, 0, 10>
<T4, C, 120, 150>
<T3 commit>
    
```

Assume that the system was crashed immediately after the $\langle T_3 \text{ commit} \rangle$ log record. Prepare the redo-list and undo-list for the recovery process? Justify your answer.

(3+4+3+6)

7. (a) Write short notes on: Data Independence.
(b) What is a data model? List the types of data models.
(c) Differentiate between natural JOIN and OUTER JOIN.
(d) What is meant by disk buffer?
(e) What are uncommitted modifications?
(f) What does the cardinality ratio specify? With example.

(3+3+3+2+2+3)

8. (a) In a hospital, various departments are there. Each doctor is associated with one department. A patient gets enrolled into a department under one of the doctors in that department. It may be required, that he/she may be treated by other doctors of same /different departments also. Doctors suggests various tests for the patients, those are noted along with their reports. System also keeps the details of departments, doctors, patients, enrolled under whom, what tests suggested for a patient by whom etc. Draw an E-R diagram for the system.
(b) What is primary key? How do you select a PK?
(c) The schema that can be prepared from the above E-R diagram is fully normalized? Justify your answer.

(10+3+3)