

CSCI 470 – Sample Final Exam

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NAME _____

Directions: This test is open book and notes. Show your work on all problems, giving any (reasonable) assumptions. 100 total points. Points per problem are listed in parentheses in front of each problem. Four total pages.

1. (25 points total) Use the schedule below to answer the following subparts to this question. EOT means “End of Transaction”.

Time	T1	T2	T3
1			Read(A)
2			Read(C)
3			Read(B)
4	Read(B)		
5	Read(A)		
6	Write(A)		
7	Write(B)		
8		Read(B)	
9		Write(B)	
10			Write(A)
11			Write (C)
12			EOT
13		Read (C)	
14		EOT	
15	Read (C)		
16	EOT		

a) (10 points) Draw the precedence graph for the above schedule. Is the above schedule conflict-serializable? Why or why not?

b) (15 points) Using timestamping as a technique to control concurrency, trace through what would happen using the schedule above. Show all transaction and read and write timestamps and explain what would happen with each advance of time:

2. (25 points total, 10 points each subpart) Using the four relations given below for a University database, give the following two queries in SQL. Make any reasonable assumptions.

Student(Name, Studentnumber, Class, MajorDepartment)

Course(Coursename, Coursenumber, CreditHours, Department)

Section(SectionIdentifier, Coursenumber, Semester, Year, Instructor)

GradeReport(Studentnumber, SectionIdentifier, Grade)

a) (15 points) For each Major Department, give the total number of students in that major who were enrolled in Math 109 during the Spring of 2006.

b) (10 points) For each Department give the total number of distinct courses offered by that Department in the Fall of .2005.

4. (25 points) For the parallel schedule given below for transactions T1, T2 and T3 :Trace through the schedule below and show where deadlock occurs using a rigorous two-phase locking scheme. Assume that a locking scheme of upgradeable locks is used. I.e., when one wants to read a data item, they ask for a shared lock, when they want to write that same data item later on, they request an exclusive lock. Explain how the wound-wait scheme for deadlock prevention would prevent deadlock from occurring.

Time	T1	T2	T3
1			Read(A)
2			Read(C)
3			Read(B)
4	Read(B)		
5	Read(A)		
6	Write(A)		
7	Write(B)		
8		Read(B)	
9		Write(B)	
10			Write(A)
11			Write (C)
12			EOT
13		Read (C)	
14		EOT	
15	Read (C)		
16	EOT		

5.(25 points) The following list represents the log entries for four transactions T1, T2, T3, and T4 at the point of a system crash. Suppose that the immediate update protocol with checkpointing has been used. Describe the recovery process from the point of the system crash. Describe how recovery occurs in this situation. Suppose that the initial values of variables are X=25, Y=50, A=40, B=90. What are the values of each of these variables after recovery takes place? Is this a recoverable schedule? Is there any cascading rollback? At the end of your recovery, in giving the values of variables, assume only undo and redo has occurred, but no fail transactions have been rerun as yet.

NOTE: The form of the write statements in the log is: [write_item, transaction_no, variable, old_value, new_value]

```
[start_transaction, T4]
[read_item, T4, A]
[start_transaction, T1]
[write_item, T4, A, 40, 10]
[read_item, T1, X]
[read_item, T4, B]
[write_item, T4, B, 90, 95]
[read_item, T1, A]
[start_transaction, T2]
[read_item, T2, B]
[commit T4]
[write_item, T2, B, 95, 60]
[start_transaction, T3]
[write_item, T1, X, 25, 15]
[write_item, T1, A, 10, 80]
[checkpoint; L = T1, T2, T3]
[read_item, T3, X]
[write_item, T3, X, 15, 55]
[read_item, T1, Y]
[write_item, T1, Y, 50, 11]
[commit T1]
[read_item, T2, A]
[write_item, T2, A, 80, 4]
<----- system crash
```