**Metropolitan State University**

**ICS 311 —Database Management Systems**

**Homework #7**

Due: see syllabus

**Homework #7 Total: 18 Points**

**Question 1 (4 Points):**

For each of the following schedules, draw the serlializability graph (also known as **precedence graph** or **conflict graph)** and determine whether the schedule is conflict serializable or no:

1.1)

|  |  |  |
| --- | --- | --- |
| T4 | T5 | T6 |
| R(X) |  |  |
|  | R(Y) |  |
|  |  | W(X) |
|  | R(X) |  |
| R(Y) |  |  |

1.2)

|  |  |  |
| --- | --- | --- |
| T4 | T5 | T6 |
| R(X) |  |  |
| R(Y) |  |  |
| W(X) |  |  |
|  | R(Y) |  |
|  |  | W(Y) |
| W(X) |  |  |
|  | R(Y) |  |

**Question 2 (6 Points):**

* 1. (1 Points) Explain the difference between “deadlock prevention” and “deadlock detection and recovery”.
  2. (1 Points) Explain the difference between “Wait/Die” and “Wound/Wait” techniques for deadlock prevention.
  3. (2 Points) Given the following schedule, draw the wait-for graph. **Is there a deadlock?**

|  |  |  |  |
| --- | --- | --- | --- |
| T1 | T2 | T3 | T4 |
| Lock-S(A) |  |  |  |
| R(A) |  |  |  |
|  | Lock-X(B) |  |  |
|  | W(B) |  |  |
| Lock-S(B) |  |  |  |
|  |  | Lock-S(C) |  |
|  |  | R(C) |  |
|  | Lock-X(C) |  |  |
|  |  |  | Lock-x(B) |
|  |  | Lock-x(A) |  |

* 1. (2 Points) Consider the following two transactions T1 and T2:

T1: R(X) W(X) R(Y) W(Y) Commit

T2: R(Y) W(Y) R(X) W(X) Commit

Draw a schedule for T1 and T2 operations that leads to a deadlock when you use exclusive/shared locking (i.e. 3-state locking). **Draw the wait-for graph for your schedule.**

**Question 3 (2 Points):**

* 1. Explain how does the recovery manager ensure atomicity of transactions?
  2. Explain how does the recovery manager ensure durability of transactions?

**Question 4 (3 Points):**

Given the following log, **show the steps** that are taken by the recovery manger to recover from the crash.

|  |  |  |
| --- | --- | --- |
|  | **Redo Phase:** | **Undo Phase (undo T3)** |
| <T1 start> |  |  |
| <T3 start> |  |  |
| <checkpoint T1, T2, T3> |  |  |
|
| <T1,p5,200,300> |  |  |
| <T2,p3,400,500> |  |  |
| <T2 commit> |  |  |
| <T3,p3,500,600> |  |  |
|
| <T1,p5,200> |  |  |
| <T1 abort> |  |  |
|  |  |  |

**Question 5 (3 Points):**

Given the following log, **show the steps** that are taken bythe recovery manager to abort transaction T1.

|  |  |
| --- | --- |
| **Log** | **Undo Phase (undo T1)** |
| <T1 start> |  |
| <T2 start> |  |
| <T1,p1,100,200> |  |
| <T1,p2,50,60> |  |
| <T2,p1,100,200> |  |
| <T3,p4,100,200> |  |
| <T3 commit> |  |
| <T2,p5,200,300> |  |
| <T2,p3,200,300> |  |
| <T2 commit> |  |
| **T1 Crash** |  |