# CS 500: Fundamentals of Databases

*Assignment #3*

**What you will do**

In this assignment, you will be exposed to the concept of transaction management in relational database systems. For each concurrency control schedule given below, you must

1. list the conflicts
2. indicate whether the schedule is conflict serializable or not
3. if the schedule is conflict serializable, write the equivalent serial schedule (do not show the conflict graph)

For example, given the schedule

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **0** | **1** | **2** | **3** | **4** | **5** |
| **T1** | W(A) | W(B) | R(B) |  |  |  |
| **T2** |  |  |  | R(B) | W(B) | R(B) |

Conflicts:

RW - unrepeatable reads: none

WR – dirty reads: 1,3 on B 1,5 on B

WW – lost writes: 1,4 on B

Is conflict serializable? Yes

Equivalent serial schedule: T1, T2

The above example does not include an unrepeatable read. If there was an unrepeatable read, e.g. as in this schedule

|  |  |  |  |
| --- | --- | --- | --- |
|  | **0** | **1** | **2** |
| **T1** | R(A) |  | R(A) |
| **T2** |  | W(A) |  |

you can write it as

RW – unrepeatable reads: 0,1,2 on A

**Q1**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| T1 | W(B) |  |  |  | R(A) | W(A) |  |  |
| T2 |  | W(B) | R(B) | W(A) |  |  | R(A) |  |

Ans.) Conflicts:

RW - unrepeatable reads: none

WR – dirty reads: 0,2 on B 3,4 on A 5,6 on A

WW – lost writes: 0,1 on B 3,5 on A

Is conflict serializable? No

**Q2**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| T1 | W(B) | R(A) |  |  |  |  | W(A) |  |
| T2 |  |  | W(A) | W(B) | W(B) | W(A) |  |  |

Ans.) Conflicts:

RW - unrepeatable reads: none

WR – dirty reads: 1,2 on A 1,5 on A

WW – lost writes: 0,3 on B 0,4 on B 2,6 on A 5,6 on A

Is conflict serializable? No

**Q3**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| T1 | W(A) | R(A) |  | R(B) |  |  |  |  |
| T2 |  |  | R(B) |  | R(B) | W(A) | R(A) |  |

Ans.) Conflicts:

RW - unrepeatable reads: none

WR – dirty reads: 0,6 on A 1,5 on A

WW – lost writes: 0,5 on A

Is conflict serializable? Yes

Equivalent serial schedule: T1, T2

**Q4**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| T1 |  | R(A) | R(A) | R(A) |  |  |  |  |
| T2 | R(A) |  |  |  | W(A) | R(A) | W(A) |  |

Ans.) Conflicts:

RW - unrepeatable reads: none

WR – dirty reads: 1,4 on A 1,6 on A 2,4 on A 2,6 on A 3,4 on A 3,6 on A

WW – lost writes: none

Is conflict serializable? Yes

Equivalent serial schedule: T1, T2

**Q5**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| T1 | W(B) | R(A) |  | R(A) |  |  |  |  |
| T2 |  |  | W(A) |  | R(A) | R(A) |  |  |

Ans.) Conflicts:

RW - unrepeatable reads: 1,2,3 on A

WR – dirty reads: 1,2 on A 2,3 on A

WW – lost writes: none

Is conflict serializable? No

**Q6**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| T1 | R(A) |  | W(A) | R(A) | W(B) |  |  |  |
| T2 |  | W(A) |  |  |  | W(B) | R(A) |  |

Ans.) Conflicts:

RW - unrepeatable reads: 0,1,3 on A

WR – dirty reads: 0,1 on A 1,3 on As 2,6 on A

WW – lost writes: 1,2 on A 4,5 on B

Is conflict serializable? No

**Q7**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| T1 | W(A) | R(B) | W(A) |  |  |  |  |  |
| T2 |  |  |  | W(A) | R(A) | W(A) |  |  |

Ans.) Conflicts:

RW - unrepeatable reads: none

WR – dirty reads: 0,4 on A 2,4 on A

WW – lost writes: 0,3 on A 0,5 on A 2,3 on A 2,5 on A

Is conflict serializable? Yes

Equivalent serial schedule: T1, T2

**Q8**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| T1 |  | R(B) |  |  | W(A) |  | R(B) | W(A) |
| T2 | R(B) |  | W(B) | W(B) |  | W(A) |  |  |

Ans.) Conflicts:

RW - unrepeatable reads: 1,2,6 on B 1,3,6 on B

WR – dirty reads: 1,2 on B 1,3 on B 2,6 on B 3,6 on B

WW – lost writes: 4,5 on A 5,7 on A

Is conflict serializable? No

**What to submit**

Submit a file with your answers. It could be a text fie (a3.txt) or a doc file (a3.docx).