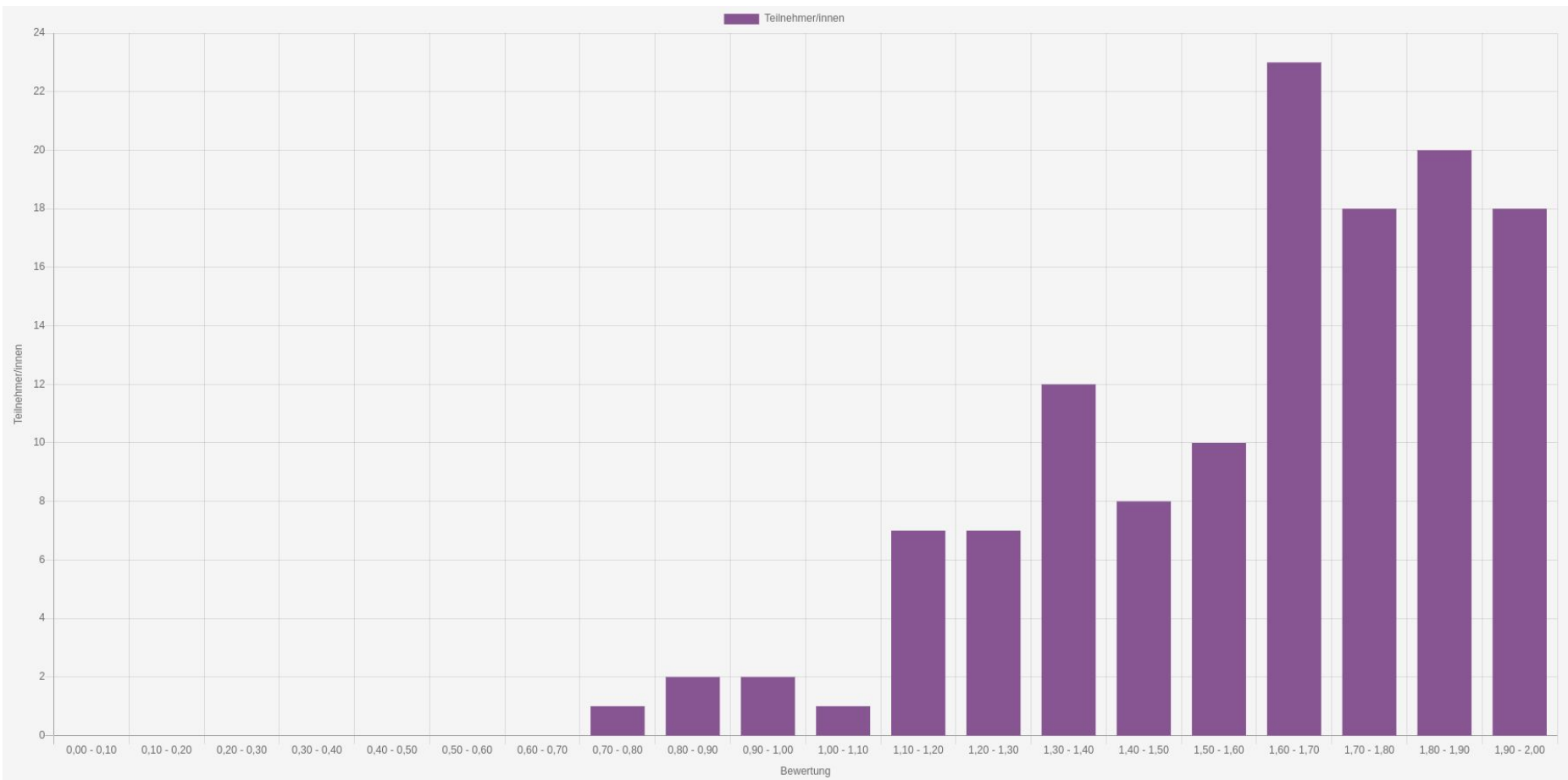# Database Technology

Exercise 9: Review

Q1: Match the failure below to the type of failure:

Hard disk needle breaks and destroys the platters - Media Failure

Q2: Steal policy means that the database system allows a transaction to overwrite the most recent committed value of a database element on disk even though the transaction has not committed.

Please choose an answer:

○ True

○ Not correct

Force: Durable but is expensive. (No-force strategy require Redo log)
Stealing: Leads to dirty writes but is most efficient. (Undo log)

Q3: Write-Ahead Logging (WAL) enforces that the global flushed LSN is always greater than or equal to the page LSN of the page to be written to disk.

Please choose an answer:

- ○ True
- ○ Not correct

Q4: What's the purpose of checkpoints for logging?

A. Reduce the number of log-records to process during recovery.

B. Improve the performance of logging.

C. Guarantee isolation of transactions.

Q5: Analysis Pass maintains a transaction table to distinguish between out of order transactions.

Select one:

○ True

○ False

Q6: In the transaction and dirty page tables below, enter the LSN for each transaction/page after the analysis pass.

Consider the following log records. The table contains the log sequence number (LSN), the transaction ID (TID), the previous log sequence number of the transaction (PSN), and the action of the log entry. The format of the UPDATE action is: (Page ID, Element ID, Old value, New value).

LSN	TID	PSN	ACTION
1	1		BEGIN_TRANSACTION
2	2		BEGIN_TRANSACTION
3	3		BEGIN_TRANSACTION
4	1	1	UPDATE (3, 1, "a", "A")
5	3	3	UPDATE (3, 2, "b", "B")
6	2	2	UPDATE (3, 3, "c", "C")
7			BEGIN_CHECKPOINT
8	3	5	UPDATE (1, 4, "d", "D")
9	2	6	UPDATE (1, 5, "e", "E")
10	1	4	COMMIT
11	1	10	END_TRANSACTION
12			END_CHECKPOINT
13	2	9	UPDATE (2, 6, "f", "F")
14	2	13	UPDATE (2, 7, "g", "G")

The recovery process starts at LSN 7 with the following transaction table and dirty pages table.

Transaction table:

TID	LSN
1	4
2	6
3	5

Dirty page table:

PID	LSN
3	4

In the transaction and dirty page tables below, enter the LSN for each transaction/page after the analysis pass.

Select "No Entry", if a transaction/page is not in the transaction/dirty page table.

Transaction table:

TID	LSN
1	No Entry
2	14
3	8

Dirty page table:

PID	LSN
1	8
2	13
3	4

Q7: Redo Pass in recovery goes forward in the log from the last checkpoint.

Select one:

- ○ True
- ○ False

Q8: Select the action taken during the redo passes for the UPDATE actions in the drop-down menu in the log above.

(Assume that pageLSN is always less than LSN).

Consider the following log records. The table contains the log sequence number (LSN), the transaction ID (TID), the previous log sequence number of the transaction (PSN), and the action of the log entry. The format of the UPDATE action is: (Page ID, Element ID, Old value, New value).

LSN	TID	PSN	ACTION	Redo Pass
1	1		BEGIN_TRANSACTION	
2	2		BEGIN_TRANSACTION	
3	3		BEGIN_TRANSACTION	
4	1	1	UPDATE (1, 1, "a", "A")	Ignore
5	2	2	UPDATE (2, 2, "b", "B")	Ignore
6	1	4	UPDATE (1, 3, "c", "C")	Ignore
7			BEGIN_CHECKPOINT	
8	1	6	UPDATE (1, 4, "d", "D")	Redo
9	2	5	UPDATE (3, 5, "e", "E")	Redo
10	2	9	COMMIT	
11	2	10	END_TRANSACTION	
12			END_CHECKPOINT	
13	1	8	UPDATE (2, 6, "f", "F")	
14	3	3	UPDATE (3, 7, "g", "G")	

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Transaction table:

TID	LSN
1	6
2	5
3	3

Dirty page table:

PID	LSN
1	4
2	5

Select the action taken during the redo passes for the UPDATE actions in the drop-down menu in the log above.
(Assume that pageLSN is always less than LSN).

Q9: Undo phase in recovery requires using the Dirty Page Table.

Select one:

○ True

○ False

Q10: Select the action taken during the undo passes for the UPDATE actions in the drop-down menus in the log above.

Consider the following log records. The table contains the log sequence number (LSN), the transaction ID (TID), the previous log sequence number of the transaction (PSN), and the action of the log entry. The format of the UPDATE action is: (Page ID, Element ID, Old value, New value).

LSN	TID	PSN	ACTION	Undo Pass
1	1		BEGIN_TRANSACTION	
2	2		BEGIN_TRANSACTION	
3	3		BEGIN_TRANSACTION	
4	1	1	UPDATE (1, 1, "a", "A")	Undo
5	2	2	UPDATE (2, 2, "b", "B")	Undo
6	2	5	UPDATE (1, 3, "c", "C")	Undo
7			BEGIN_CHECKPOINT	
8	3	3	UPDATE (3, 4, "d", "D")	Ignore
9	3	8	UPDATE (3, 5, "e", "E")	Ignore
10	3	9	COMMIT	
11	3	10	END_TRANSACTION	
12			END_CHECKPOINT	
13	1	4	UPDATE (3, 6, "f", "F")	Undo
14	1	13	UPDATE (2, 7, "g", "G")	Undo

The recovery process starts at LSN 7 with the following transaction table and dirty pages table.

Transaction table:

TID	LSN
1	4
2	6
3	3

Dirty page table:

PID	LSN
1	4
2	5

Select the action taken during the undo passes for the UPDATE actions in the drop-down menus in the log above.