Readings:

* ACID Property: <https://en.wikipedia.org/wiki/ACID_(computer_science)>
* Concurrency control <https://en.wikipedia.org/wiki/Concurrency_control>
* chapter 13: “Concurrency Control” (Petkovic)

Use the sample database created in previous lecture to answer the following three questions.



1. Create a stored procedure GetEmployeeInfo which takes @dept\_no as an input parameter, and outputs a result set which includes the following fields: emp\_no, employee full name, department name. Provide a screenshot of output results using ‘d1’ as input parameter.

create procedure GetEmployeeInfo @d1 char(4)

as

select e.emp\_no, e.emp\_fname, e.emp\_lname, d.dept\_name

from employee e join department d on e.dept\_no=d.dept\_no

where e.dept\_no = @d1;

exec GetEmployeeInfo @d1 = 'D1';

A screenshot of a cell phone

Description automatically generated

1. Create a stored procedure IncreaseBudgetAmount which takes @project\_no and @new\_budget as input parameters and returns @message as an output parameter. The stored procedure must perform the following business rules:
   1. If @project\_no is not found, it returns the message “Invalid Project Number”
   2. If @new\_ budget is greater than the current budget amount, it must update the project budget and return the message “budget amount increased”
   3. If @new\_ budget is less than or equal to the current budget, it does nothing and return the message “New budget must be greater than the current budget”

Provide sample execution commands for all three business cases, along with a screen shot of results for each.

create procedure IncreaseBudgetAmount @project\_no char(4), @new\_budget float

as

begin

if not exists (select \* from project where project\_no = @project\_no)

begin

print 'Invalid Project Number'

end

else

begin

if @new\_budget > (select budget from project where project\_no = @project\_no)

begin

update project set budget = @new\_budget where project\_no = @project\_no

print 'budget amount increased'

end

else

begin

print 'New budget must be greater than the current budget'

end

end

end

exec IncreaseBudgetAmount @project\_no = 'p8', @new\_budget = 10000.00;

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exec IncreaseBudgetAmount @project\_no = 'p1', @new\_budget = 10000.00;

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exec IncreaseBudgetAmount @project\_no = 'p1', @new\_budget = 80000.00;

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select \* from project;

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1. Create a User Defined Function GetBudgetAmount which takes @project\_name and returns the budget for a given project. If it cannot find the record it returns NULL. Show a SQL example of a function being used to the budget for “CRM system”

create function GetBudgetAmount (@project\_name varchar(50))

returns table

as return (select budget from project where project\_name = @project\_name);

select \* from GetBudgetAmount('CRM system');

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1. What is the name of a single logical operation on the data to satisfy ACID property?

**Transaction.**

1. Which ACID property does the following DDLs satisfy?
   1. CREATE TABLE Customer (CustomerID int PRIMARY KEY, CustomerName varchar(100) NOT NULL)

**Consistency, Durability.**

1. Which ACID property ensures the integrity of data reads?

**Consistency.**

1. Failure to write data to non-volatile memory violates which property?**d**
   1. Atomicity
   2. Consistency
   3. Isolation
   4. **Durability**
2. State the reasons why concurrency control needed?

**Concurrency control in**[**Database management systems**](https://en.wikipedia.org/wiki/Database_management_system)**(DBMS; e.g.,**[**Bernstein et al. 1987**](https://en.wikipedia.org/wiki/Concurrency_control#Bern87)**, [Weikum and Vossen 2001](https://en.wikipedia.org/wiki/Concurrency_control" \l "Weikum01)), other**[**transactional**](https://en.wikipedia.org/wiki/Database_transaction)**objects, and related distributed applications (e.g.,**[**Grid computing**](https://en.wikipedia.org/wiki/Grid_computing)**and**[**Cloud computing**](https://en.wikipedia.org/wiki/Cloud_computing)**) ensures that**[**database transactions**](https://en.wikipedia.org/wiki/Database_transaction)**are performed**[**concurrently**](https://en.wikipedia.org/wiki/Concurrency_(computer_science))**without violating the**[**data integrity**](https://en.wikipedia.org/wiki/Data_integrity)**of the respective**[**databases**](https://en.wikipedia.org/wiki/Database)**. Thus concurrency control is an essential element for correctness in any system where two database transactions or more, executed with time overlap, can access the same data, e.g., virtually in any general-purpose database system.**

1. What is the difference between a local transaction and a distributed transaction?

**Local transactions are performed on a single database table, but distributed transactions are performed on more than one database tables. b. Local transactions are performed on a single database server, but distributed transactions can be performed across multiple database servers.**

1. When should you use the SAVE TRANSACTION statement?

**The Database Engine supports optimistic concurrency so that older versions of data rows are saved, and any process that reads the same data uses the row version that was active when it started reading data. For that reason, a process that modifies the data can do so without any limitation, because all other processes that read the same data access the saved versions of the data. The only conflict scenario occurs when two or more write operations use the same data. In that case, the system displays an error so that the client application can handle it.**

1. Discuss the difference between row-level and page-level locking.

**A row lock is the lowest level of granularity of locking possible in SQL Server. This means one or more specific rows will be locked, and the adjacent rows are still available for locking by concurrent queries. A page lock in SQL Server will lock 8K worth of data even when your query only needs 10 bytes from the page.**

1. Can a user explicitly influence the locking behavior of the system?

**Yes. User can either locking hints or the LOCK\_TIMEOUT option of the SET statement to affect locks.**