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Section:	622-A

Part A: Simulating a Deadlock Between Two Transactions

```
IF OBJECT_ID('dbo.StudentEnrollments', 'U') IS NOT NULL
    DROP TABLE dbo.StudentEnrollments;
GO
```

```
CREATE TABLE dbo.StudentEnrollments (
    student_id INT PRIMARY KEY,
    student_name VARCHAR(100),
    course_id VARCHAR(10),
    enrollment_date DATE
);
GO
```

```
INSERT INTO dbo.StudentEnrollments (student_id, student_name, course_id,
enrollment_date) VALUES
(1, 'Ashish', 'CSE101', '2024-06-01'),
(2, 'Smaran', 'CSE102', '2024-06-01'),
(3, 'Vaibhav', 'CSE103', '2024-06-01');
GO
```

```
BEGIN TRAN;
```

```
SELECT * FROM dbo.StudentEnrollments WITH (UPDLOCK, HOLDLOCK) WHERE
student_id = 1;
```

```
SELECT * FROM dbo.StudentEnrollments WITH (UPDLOCK, HOLDLOCK) WHERE
student_id = 2;
```

```
COMMIT TRAN;
```

Output:

student_id	student_name	course_id	enrollment_date
1	Ashish	CSE101	2024-06-01
2	Smaran	CSE102	2024-06-01

Part B: Applying MVCC to Prevent Conflicts During Concurrent Reads/Writes

IF OBJECT_ID('dbo.StudentEnrollments', 'U') IS NOT NULL

DROP TABLE dbo.StudentEnrollments;

GO

CREATE TABLE dbo.StudentEnrollments (

student_id INT PRIMARY KEY,

student_name VARCHAR(100),

course_id VARCHAR(10),

enrollment_date DATE

);

GO

INSERT INTO dbo.StudentEnrollments VALUES

(1, 'Ashish', 'CSE101', '2024-06-01');

GO

BEGIN TRANSACTION;

UPDATE dbo.StudentEnrollments

SET enrollment_date = '2024-07-10'

WHERE student_id = 1;

BEGIN TRANSACTION;

-- Will block until Session 1 commits

SELECT enrollment_date

FROM dbo.StudentEnrollments WITH (UPDLOCK, HOLDLOCK)

WHERE student_id = 1;

COMMIT TRANSACTION;

Output:

```
enrollment_date
-----
2024-07-10
```

Part C: Comparing Behavior With and Without MVCC in High-Concurrency

```
IF OBJECT_ID('dbo.StudentEnrollments', 'U') IS NOT NULL
    DROP TABLE dbo.StudentEnrollments;
```

```
CREATE TABLE dbo.StudentEnrollments (
    student_id INT PRIMARY KEY,
    student_name VARCHAR(100),
    course_id VARCHAR(10),
    enrollment_date DATE
);
```

```
INSERT INTO dbo.StudentEnrollments VALUES
(1, 'Ashish', 'CSE101', '2024-06-01');
BEGIN TRANSACTION;
```

```
UPDATE dbo.StudentEnrollments
SET enrollment_date = '2024-07-10'
WHERE student_id = 1;
```

```
BEGIN TRANSACTION;
SELECT *
FROM dbo.StudentEnrollments WITH (ROWLOCK, UPDLOCK)
WHERE student_id = 1;
```

```
COMMIT TRANSACTION;
```

Output:

student_id	student_name	course_id	enrollment_date
1	Ashish	CSE101	2024-07-10