

“Indexing” лабораторын ажил

Өгөгдлийн сангийн систем ICSI311

МУИС – ХШУИС

Компьютерийн ухаан 2-р түвшин

А. Гаусар 21B1NUM1182

Агуулга:

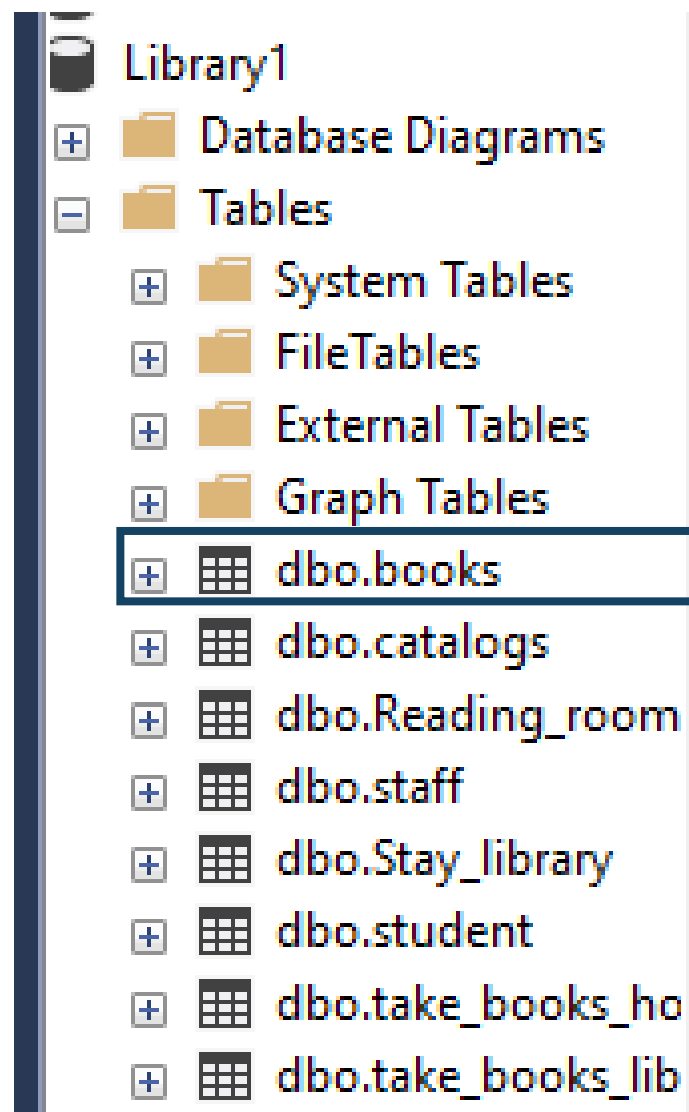
- ❖ Өгөгдлийн сангаасаа сонгосон хүснэгтийн талаар мэдээлэл
- ❖ Random – оор хэрхэн хүснэгтэд утга оруулсан тухай
- ❖ Index үүсгэсэн баганы тухай
- ❖ Хийсэн select үйлдлүүд
- ❖ Select statement – ийн хугацааны харьцуулалт
- ❖ Дүгнэлт
- ❖ Эх сурвалж

Өгөгдлийн сангаасаа сонгосон хүснэгтийн талаар мэдээлэл

- `TABLE [books] (`
- `[id] int NOT NULL PRIMARY KEY,`
- `[author] char,`
- `[publish] char,`
- `[published_date] date NOT NULL,`
- `[name] char NOT NULL,`
- `[catalog_id] int NOT NULL,`
- `[quantity] int NOT NULL`
- `)`

books	
id	int 1
author	char
publish	char
published_date	date
name	char
catalog_id	int *
quantity	int

- Энэ хүснэгт нь номын сангийн бүх номнуудын талаар мэдээллийг хадгалж байгаа ба **id** – аараа нэгэн утгатай тодорхойлогдоно.
- Номнуудаа багцалж өгөхийн тулд тодорхой catalog – т харьяалагдахаар хийсэн. Энэ нь номоо олоход илүү хялбар болгоно.
- Тухайн өгөгдлийн сангаа Library1 гэж нэрлэсэн. Мөн MSSQL server – ийг ашигласан.



Random – оор хэрхэн хүснэгтэд утга оруулсан тухай

The screenshot displays the Microsoft SQL Server Management Studio (SSMS) interface. The title bar indicates the connection is to 'DESKTOP-MCTVAFF\SQLEXPRESS.test (DESKTOP-MCTVAFF\Acer (53))'. The main window shows a T-SQL script for inserting random data into a table named 'book'.

Object Explorer: Shows the server structure with 'DESKTOP-MCTVAFF\SQL' expanded, showing 'Databases', 'Security', 'Server Objects', 'Replication', 'PolyBase', 'Management', and 'XEvent Profiler'.

Query Editor: Contains the following T-SQL script:

```
55 DECLARE @i INT
56 SET @i = 1
57 WHILE @i <= 25000000
58 BEGIN
59     INSERT INTO book(id, author, name, quantity, catalog_id)
60     VALUES(
61         @i,
62         CONCAT('Author_', FLOOR(RAND()*(100000-1+1))+1),
63         CONCAT('Book_', FLOOR(RAND()*(1000-1+1))+1),
64         FLOOR(RAND()*(100-1+1))+1,
65         FLOOR(RAND()*(10-1+1))+1
66     )
67     PRINT @i
68     SET @i = @i + 1
69 END
70 /*(CAST(@i as int),
71 'Author - ' + CAST(RAND(@i as varchar(10)),
```

Results: The script has executed successfully, showing four rows of results:

```
(1 row affected)
16642354

(1 row affected)
16642355

(1 row affected)
16642356

(1 row affected)
16642357
```

Status Bar: Shows 'Executing query...' and 'DESKTOP-MCTVAFF\SQLEXPRESS ... | DESKTOP-MCTVAFF\Acer (53) | test | 02:37:34 | 0 rows'.

Taskbar: Shows the Windows taskbar with the Start button, Search bar, and various application icons. The system tray shows the date and time as 11:48 AM on 3/6/2023.

1. Тухайн хүснэгтэнд 4 баганатай байхад хангалттай гэж бодсоны үндсэн дээр рандом утга оруулахдаа **id, author, name, catalog_id, quantity** баганууд дээр утга оруулсан..

insert values.s...er (53)) Executing...*

```
55 DECLARE @i INT
56 SET @i = 1
57 WHILE @i <= 25000000
58 BEGIN
59     INSERT INTO book(id, author, name, quantity, catalog_id)
60     VALUES(
61         @i,
62         CONCAT('Author_', FLOOR(RAND()*(100000-1+1))+1),
63         CONCAT('Book_', FLOOR(RAND()*(1000-1+1))+1),
64         FLOOR(RAND()*(100-1+1))+1,
65         FLOOR(RAND()*(10-1+1))+1
66     )
67     PRINT @i
68     SET @i = @i + 1
69 END
```

book insert values.sql - DESKTOP-MCTVAFF\SQLEXPRESS.test (DESKTOP-MCTVAFF\Acer (53))* - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

test Execute

Object Explorer

Connect

DESKTOP-MCTVAFF\SQL

Databases

Security

Server Objects

Replication

PolyBase

Management

XEvent Profiler

```
55 DECLARE @i INT
56 SET @i = 1
57 WHILE @i <= 25000000
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59 INSERT INTO book(id, author, name, quantity, catalog_id)
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61     @i,
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63     CONCAT('Book_', FLOOR(RAND()*(1000-1+1))+1),
64     FLOOR(RAND()*(100-1+1))+1,
65     FLOOR(RAND()*(10-1+1))+1
66 )
67 PRINT @i
68 SET @i = @i + 1
69 END
70 /*(CAST(@i as int),
71 'Author - ' + CAST(RAND(@i as varchar(10)),
```

25 сая мөр утга
оруулахад маш их
хугацаа буюу 05
цаг 22 минут 01
секунд
зарцуулагдсан

Messages

Client Statistics

24999999

(1 row affected)

25000000

Completion time: 2023-03-06T14:32:44.4423627+08:00

Query executed successfully.

DESKTOP-MCTVAFF\SQLEXPRESS ... | DESKTOP-MCTVAFF\Acer (53) | test | 05:22:01 | 0 rows

Ready

Ln 75000003 Col 1 Ch 1 INS

44°F Mostly cloudy

Search

4:59 PM 3/6/2023

Хийсэн select үйлдлүүд

Query

```
71  
72 SELECT top(30)* FROM book ORDER BY id ASC;  
73
```

Эхний 30-н өгөгдлийг select хийж
харуулсан болно.

00:00:02 | 30 rows

Үр дүн

	id	author	name	catalog_id	quantity
1	1	Author_17438	Book_298	3	88
2	2	Author_60102	Book_926	4	70
3	3	Author_11772	Book_343	10	31
4	4	Author_3517	Book_655	3	55
5	5	Author_80965	Book_922	9	56
6	6	Author_1341	Book_359	6	75
7	7	Author_9418	Book_701	9	12
8	8	Author_86906	Book_407	10	69
9	9	Author_22040	Book_813	9	37
10	10	Author_63644	Book_7	10	39
11	11	Author_87827	Book_74	5	34
12	12	Author_33915	Book_120	8	98
13	13	Author_86319	Book_385	4	85
14	14	Author_87003	Book_243	2	43
15	15	Author_70044	Book_289	8	84
16	16	Author_66302	Book_606	5	48
17	17	Author_42112	Book_335	7	51
18	18	Author_1052	Book_245	4	86
19	19	Author_39360	Book_570	8	38
20	20	Author_15815	Book_743	1	50
21	21	Author_50567	Book_606	2	65

✓ Query executed successfully.

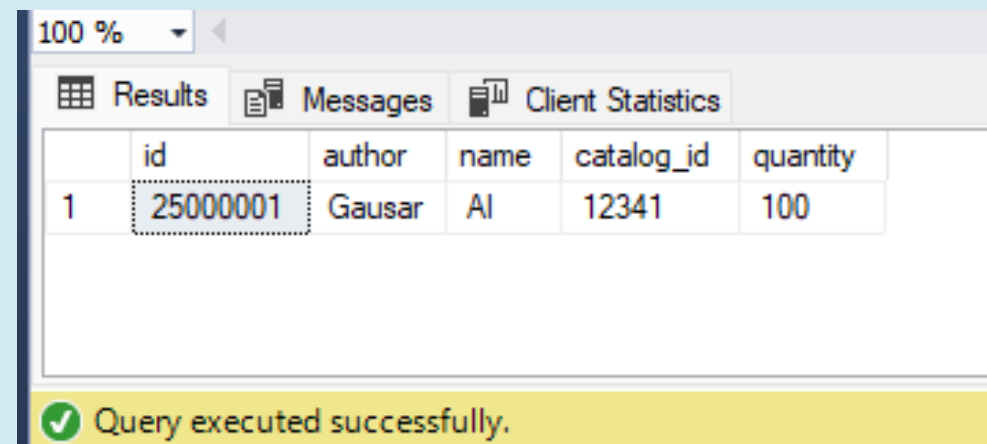
Хийсэн select үйлдлүүд

query

```
INSERT INTO book VALUES (25000001, 'Gausar', 'AI', 12341, 100);  
SELECT * FROM book WHERE author='Gausar';
```

Нийт 25 сая мөрнөөс select
хийхэд 00:05:03 секунд
ажиллаж байна.

Үр дүн



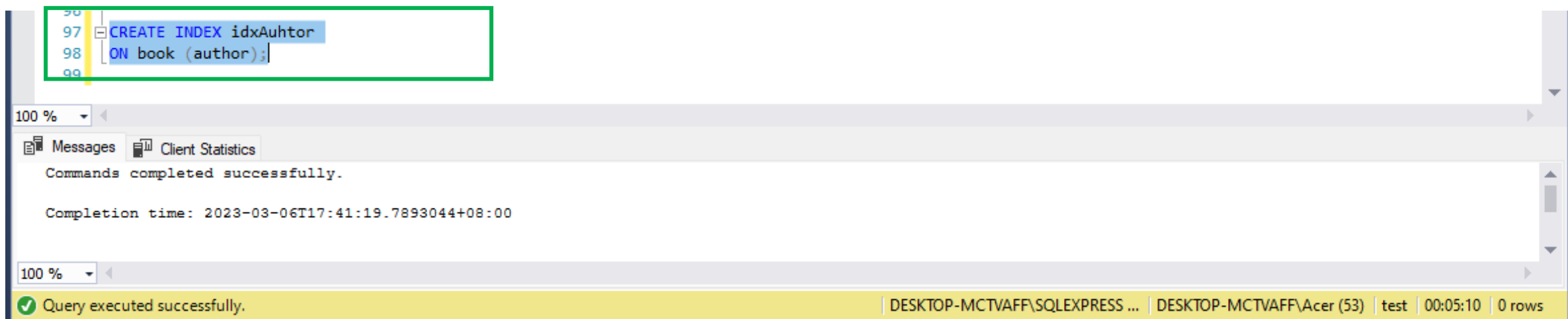
	id	author	name	catalog_id	quantity
1	25000001	Gausar	AI	12341	100

Query executed successfully.

DESKTOP-MCTVAFF\SQLEXPRESS ... | DESKTOP-MCTVAFF\Acer (53) | test | 00:05:03 | 1 rows

Index үүсгэсэн баганы тухай

- Author баганад индекс үүсгэсэн.



The screenshot displays the SQL Server Enterprise Manager interface. At the top, a query window shows the following SQL command:

```
96  
97 CREATE INDEX idxAuhtor  
98 ON book (author);  
99
```

Below the query window, the Messages pane shows the following output:

```
Commands completed successfully.  
  
Completion time: 2023-03-06T17:41:19.7893044+08:00
```

At the bottom, a yellow status bar indicates: "Query executed successfully." followed by connection details: "DESKTOP-MCTVAFF\SQLEXPRESS ..." and "DESKTOP-MCTVAFF\Acer (53) | test | 00:05:10 | 0 rows".

- Index үүсгэсэний дараа өмнөх SELECT query-ээ дахин ажиллуулсан.

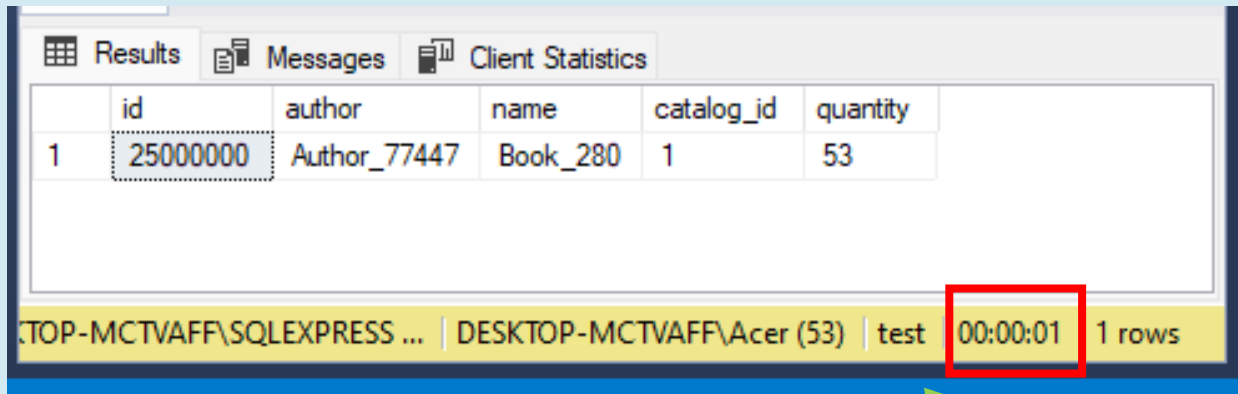
Ингэхэд 00:00:01 секунд хугацаа зарцуулагдаж байна.

The screenshot displays the SQL Server Enterprise Manager interface. At the top, a query window shows the SQL statement: `SELECT * FROM book WHERE author='Gausar';`. Below this, the 'Results' tab is active, showing a single row of data from the 'book' table. The data is as follows:

	id	author	name	catalog_id	quantity
1	25000001	Gausar	AI	12341	100

At the bottom of the interface, a status bar indicates that the query was executed successfully. It also shows the server name 'DESKTOP-MCTVAFF\SQLEXPRESS ...', the instance name 'DESKTOP-MCTVAFF\Acer (53)', the user 'test', and the execution time '00:00:01' for 1 row. The execution time '00:00:01' is highlighted with a red box.

Хийсэн select үйлдлүүд

query	Үр дүн												
<pre>97 98 SELECT * FROM book WHERE id = 25000000;</pre>	 <p>The screenshot shows the SQL Server Enterprise Manager interface. The 'Results' tab is active, displaying a table with one row of data. The 'Messages' tab is also visible. The 'Client Statistics' tab shows the execution time of the query as 00:00:01, which is highlighted with a red box. A green arrow points from the text '00:00:01' in the left column to this red box.</p> <table><tr><th></th><th>id</th><th>author</th><th>name</th><th>catalog_id</th><th>quantity</th></tr><tr><td>1</td><td>25000000</td><td>Author_77447</td><td>Book_280</td><td>1</td><td>53</td></tr></table> <p>TOP-MCTVAFF\SQLEXPRESS ... DESKTOP-MCTVAFF\Acer (53) test 00:00:01 1 rows</p>		id	author	name	catalog_id	quantity	1	25000000	Author_77447	Book_280	1	53
	id	author	name	catalog_id	quantity								
1	25000000	Author_77447	Book_280	1	53								

Нийт 25 сая мөрнөөс select
хийхэд 00:00:01 секунд
ажиллаж байна.

Дүгнэлт

Index хийгээгүй байхад query ажиллахад удаж удаан ажиллаж байсан. Иймд том хэмжээний өгөгдлийн санд indexing хийж өгөхгүй бол query удаан ажиллана. Харин индекс хийснийхээ дараа 1 секундэнд ажиллаж байна. Ойролцоогоор 303 дахин хурдан ажиллаж байна.

Ашигласан апп:

✓MSSQL

✓Dbdiagram.io