

# Database Technologies – UE20CS343

## Assignment – 1

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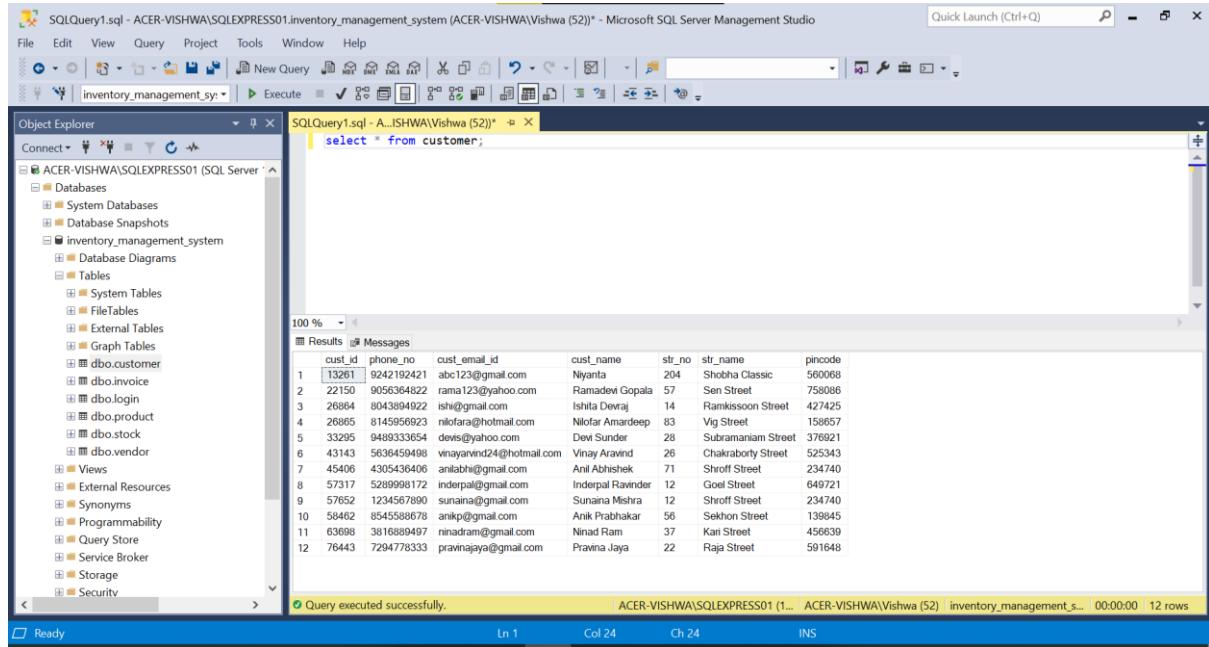
SRN: PES2UG20CS389

Sec: F

Date: 10-03-2023

### Task 1: Database creation and simple crud operations:

(a)



The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left shows a connection to 'ACER-VISHWA\SQLEXPRESS01' with the database 'inventory\_management\_system' selected. The 'Tables' node under the database is expanded, showing tables like 'customer', 'invoice', 'login', 'product', 'stock', and 'vendor'. The 'Results' tab in the center displays the output of the query 'select \* from customer;'. The results show 12 rows of data with columns: cust\_id, phone\_no, cust\_email\_id, cust\_name, str\_no, str\_name, and pincode. The data includes various names and addresses. A status bar at the bottom indicates the query was executed successfully.

cust_id	phone_no	cust_email_id	cust_name	str_no	str_name	pincode
1	9242192421	abc123@gmail.com	Niyanta	204	Shobha Classic	560068
2	22150	9056364822	Rama123@yahoo.com	57	Sen Street	758086
3	26864	8043894922	ishi@gmail.com	14	Ramkisson Street	427425
4	26865	8145956923	nifaraf@hotmail.com	83	Vig Street	158657
5	33295	9489333654	devis@yahoo.com	28	Subramaniam Street	376921
6	43143	5636459498	vinayarnv24@hotmail.com	26	Chakraborty Street	525343
7	45406	4305436406	anilabhi@gmail.com	71	Shroff Street	234740
8	57317	5269998172	inderpal@gmail.com	12	Goel Street	649721
9	57652	1234567890	sunaina@gmail.com	12	Shroff Street	234740
10	58462	8545588678	ankip@gmail.com	56	Sekhon Street	139845
11	63698	3816889497	ninadram@gmail.com	37	Kan Street	456639
12	76443	7294778333	pravinajaya@gmail.com	22	Raja Street	501648

Acer-Vishwa\SQLEXPRESS01.inventory\_management\_system - dbo.customer - Microsoft SQL Server Management Studio

File Edit View Project Table Designer Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

ACER-VISHWA\SQLEXPRESS01 (SQL Server 11) ->

- Databases
  - System Databases
  - Database Snapshots
  - inventory\_management\_system
  - Database Diagrams
- Tables
  - System Tables
  - FileTables
  - External Tables
  - Graph Tables
  - dbo.customer
  - dbo.invoice
  - dbo.login
  - dbo.product
  - dbo.stock
  - dbo.vendor
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  - Query Store
  - Service Broker
  - Storage
  - Security

SQLQuery1.sql - A...ISHWA\Vishwa (52)\*

Column Name	Data Type	Allow Nulls
cust_id	int	<input type="checkbox"/>
phone_no	bigint	<input type="checkbox"/>
cust_email_id	nvarchar(50)	<input type="checkbox"/>
cust_name	nvarchar(50)	<input type="checkbox"/>
str_no	tinyint	<input checked="" type="checkbox"/>
str_name	nvarchar(50)	<input checked="" type="checkbox"/>
pincode	int	<input checked="" type="checkbox"/>

Column Properties

(General)

Name: cust\_id  
Allow Nulls: No  
Data Type: int  
Default Value or Binding:

Table Designer

Collation: <database default>

(General)

(b)

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

ACER-VISHWA\SQLEXPRESS01 (SQL Server 11) ->

- Databases
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  - Security

SQLQuery1.sql - A...ISHWA\Vishwa (52)\*

```
select * from invoice;
```

Results

prod_id	invoice_no	invoice_date	selling_price	prod_qty	discount	phone_no	vendor_id	
1	53028	56489	2022-11-05	32 639993896484	2	0.0399999991059303	1234567890	73660
2	59854	20453	2022-11-18	15.1999998092651	3	0.20000002980232	8545588678	73660
3	59854	38980	2022-10-22	15.1999998092651	2	0.20000002980232	5289998172	75071
4	59854	43769	2022-11-18	18.4300003051758	3	0.029999993294477	9242192421	74044
5	59854	49678	2022-11-18	15.1999998092651	3	0.20000002980232	8545588678	73660
6	59854	69302	2022-11-18	15.1999998092651	3	0.20000002980232	8545588678	73660
7	59854	85957	2022-10-23	15.1999998092651	2	0.20000002980232	8043804922	75071
8	59854	88070	2022-11-18	15.1999998092651	3	0.20000002980232	8545588678	73660
9	59854	99454	2022-10-23	15.1999998092651	2	0.20000002980232	8545588678	40101

Messages

Query executed successfully.

ACER-VISHWA\SQLEXPRESS01 (1...) | ACER-VISHWA\Vishwa (52) | inventory\_management\_s... | 00:00:00 | 9 rows

Acer-Vishwa\SQLEXPRESS01.inventory\_management\_system - dbo.invoice - Microsoft SQL Server Management Studio

File Edit View Project Table Designer Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

Connect ▾

ACER-VISHWA\SQLEXPRESS01 (SQL Server 11) ▾

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- Storage
- Security

SQLQuery1.sql - Acer-Vishwa\Shweta (52)\*

Column Name Data Type Allow Nulls

prod_id	int	<input type="checkbox"/>
invoice_no	int	<input type="checkbox"/>
invoice_date	date	<input type="checkbox"/>
selling_price	float	<input type="checkbox"/>
prod_qty	tinyint	<input type="checkbox"/>
discount	float	<input checked="" type="checkbox"/>
phone_no	bigint	<input checked="" type="checkbox"/>
vendor_id	int	<input type="checkbox"/>

Column Properties

(General)  
(Name) prod\_id  
Allow Nulls No  
Data Type int  
Default Value or Binding  
Table Designer  
Collation <database default>  
(General)

Ready

(c)

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

Connect ▾

ACER-VISHWA\SQLEXPRESS01 (SQL Server 11) ▾

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SQLQuery1.sql - Acer-Vishwa\Shweta (52)\*

select \* from login;

Results

email_id	pass
1 harry@gmail.com	har1234%
2 msn124@yahoo.com	12345678
3 neeta@gmail.com	user1234
4 rakesh@gmail.com	rakeshm345
5 ran@gmail.com	ram135&
6 ramesh@gmail.com	rameshH234
7 ranjeeta@gmail.com	ran234%
8 vini@gmail.com	123
9 vs@gmail.com	user123
10 vishwa@gmail.com	admin123
11 vismaya@gmail.com	admin1234

Messages

Query executed successfully.

ACER-VISHWA\SQLEXPRESS01 (1... ACER-VISHWA\Vishwa (52) | inventory\_management\_s... 00:00:00 | 11 rows

Ready

email_id	pass
1 harry@gmail.com	har1234%
2 msn124@yahoo.com	12345678
3 neeta@gmail.com	user1234
4 rakesh@gmail.com	rakeshm345
5 ran@gmail.com	ram135&
6 ramesh@gmail.com	rameshH234
7 ranjeeta@gmail.com	ran234%
8 vini@gmail.com	123
9 vs@gmail.com	user123
10 vishwa@gmail.com	admin123
11 vismaya@gmail.com	admin1234

Screenshot of Microsoft SQL Server Management Studio (SSMS) showing the Object Explorer and a table definition.

The Object Explorer shows the connection to **Acer-Vishwa\SQLEXPRESS01.inventory\_management\_system**. Under the **Tables** node, there is a table named **dbo.login**.

The table **dbo.login** has two columns:

Column Name	Data Type	Allow Nulls
email_id	nvarchar(50)	<input type="checkbox"/>
pass	nvarchar(50)	<input type="checkbox"/>

The **Column Properties** pane shows the following details for the **email\_id** column:

- (General)**:
  - Name: email\_id
  - Allow Nulls: No
  - Data Type: nvarchar
  - Default Value or Binding:
  - Length: 50
- Table Designer**:
  - (General)**

(d)

Screenshot of Microsoft SQL Server Management Studio (SSMS) showing the Object Explorer and a query results window.

The Object Explorer shows the connection to **ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system**. Under the **Tables** node, there is a table named **product**.

The query `select * from product;` was run, and the results are displayed in the Results pane:

product_id	product_name	cost_price	manufacturer	mrp
14270	ghee	440	Nandini	450
15292	paneer	55	Milky Mist	60
45124	cheese	85	Amul	90
53028	curd	31	Amul	34
56145	butter	25	Amul	28
59854	milk	17	Amul	19
80811	Bread	45	Britania	55
81010	cow milk	15	Nandini	17
83067	Curd	32	Milky Mist	37
86934	ice cream family pack	180	Quality Walls	200
90295	Chocolate	60	Cadbury	80
98390	ice cream cone	35	Cornetto	40
99016	yogurt	25	Nandini	30

The status bar at the bottom indicates: **Query executed successfully.** ACER-VISHWA\SQLEXPRESS01 (1... ACER-VISHWA\Vishwa (52) | inventory\_management\_s... 00:00:00 | 13 rows

Acer-Vishwa\SQLEXPRESS01.inventory\_management\_system - dbo.product - Microsoft SQL Server Management Studio

File Edit View Project Table Designer Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

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ACER-VISHWA\SQLEXPRESS01 (SQL Server 11) ▾

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- Security

SQLQuery1.sql - A...ISHWA\Vishwa (52)\*

Column Name	Data Type	Allow Nulls
product_id	int	<input type="checkbox"/>
product_name	nvarchar(50)	<input type="checkbox"/>
cost_price	smallint	<input type="checkbox"/>
manufacturer	nvarchar(50)	<input type="checkbox"/>
mrp	smallint	<input type="checkbox"/>

Column Properties

(General)  
(Name): product\_id  
Allow Nulls: No  
Data Type: int  
Default Value or Binding:  
Table Designer  
Collation: <database default>  
(General)

Ready

The screenshot shows the Microsoft SQL Server Management Studio interface. In the Object Explorer, the 'product' table under the 'inventory\_management\_system' database is selected. In the center pane, the 'Table Designer' is open, displaying the columns: product\_id (int), product\_name (nvarchar(50)), cost\_price (smallint), manufacturer (nvarchar(50)), and mrp (smallint). Below the table definition, the 'Column Properties' window is open for the 'product\_id' column, showing its name, data type (int), and other properties like 'Allow Nulls' set to 'No'. At the bottom, the status bar indicates 'Ready'.

( e )

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

Connect ▾

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SQLQuery1.sql - A...ISHWA\Vishwa (52)\*

```
select * from stock;
```

Results

pid	purchase_date	mfg_date	pqty
1	14270	2022-11-17	2022-09-20 100
2	15292	2022-11-24	2022-10-19 50
3	45124	2022-11-24	2022-09-29 50
4	53028	2022-10-18	2022-10-18 88
5	56145	2022-10-12	2022-10-10 65
6	59854	2022-10-21	2022-10-21 80
7	81010	2022-10-21	2022-10-21 60
8	99016	2022-10-17	2022-10-16 50

Messages

Query executed successfully.

ACER-VISHWA\SQLEXPRESS01 (1...) | ACER-VISHWA\Vishwa (52) | inventory\_management\_s... | 00:00:00 | 8 rows

Ln 1 Col 20 Ch 20 INS

Ready

The screenshot shows the Microsoft SQL Server Management Studio interface. The 'Results' tab is active, displaying the output of the query 'select \* from stock;'. The results show eight rows of data with columns: pid, purchase\_date, mfg\_date, and pqty. The status bar at the bottom indicates 'Query executed successfully.' and shows the execution time as 00:00:00 and 8 rows affected.

Acer-Vishwa\SQLEXPRESS01.inventory\_management\_system - dbo.stock - Microsoft SQL Server Management Studio

File Edit View Project Table Designer Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

ACER-VISHWA\SQLEXPRESS01 (SQL Server 11) ->

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- Service Broker
- Storage
- Security

SQLQuery1.sql - A...ISHWA\Vishwa (52)\*

Column Name	Data Type	Allow Nulls
pid	int	<input type="checkbox"/>
purchase_date	date	<input type="checkbox"/>
mfg_date	date	<input type="checkbox"/>
pqty	tinyint	<input checked="" type="checkbox"/>

Column Properties

(General)

Name: pid  
Allow Nulls: No  
Data Type: int  
Default Value or Binding:

Table Designer

Collation: <database default>

(General)

(f)

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

Quick Launch (Ctrl+Q)

Object Explorer

ACER-VISHWA\SQLEXPRESS01 (SQL Server 11) ->

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SQLQuery1.sql - A...ISHWA\Vishwa (52)\*

```
select * from vendor;
```

Results

	fname	lname	vendor_id	email_id	product_id	cust_id
1	harry	singh	75071	harry@gmail.com	59854	57317
2	harry	singh	75071	harry@gmail.com	59854	26864
3	harry	singh	75071	harry@gmail.com	59854	58462
4	harry	singh	75071	harry@gmail.com	53028	57317
5	harry	singh	75071	harry@gmail.com	14270	58462
6	harry	singh	75071	harry@gmail.com	59854	63698
7	harry	singh	75071	harry@gmail.com	98390	63698
8	ramesh	sharma	40101	ramesh@gmail.com	59854	33295
9	ramesh	sharma	40101	ramesh@gmail.com	15292	33295
10	ramesh	sharma	40101	ramesh@gmail.com	59854	33295
11	ramesh	sharma	40101	ramesh@gmail.com	14270	22150
12	ramesh	sharma	40101	ramesh@gmail.com	59854	22150
13	ram	c	70978	ram@gmail.com	53028	76443
14	ram	c	70978	ram@gmail.com	59854	76443
15	ranjeeta	s	94138	ranjeeta@gmail.com	59854	45406
16	ranjeeta	s	94138	ranjeeta@gmail.com	45124	26864
17	ranjeeta	s	94138	ranjeeta@gmail.com	98390	45406
18	rakesh	sharma	29690	rakesh@gmail.com	81010	43143
19	rakesh	sharma	29690	rakesh@gmail.com	15292	43143
20	vishwa	mehta	73660	vis@gmail.com	59854	58462
21	vismaya	r	84992	vismaya@gmail.com	NULL	NULL
22	neeta	sharma	40226	neeta@gmail.com	NULL	NULL
23	Mehul	Mehta	74044	msm124@yahoo.co...	59854	13261
24	vishwa	mehta	73660	vis@gmail.com	53028	57652

Query executed successfully.

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

New Query Execute

inventory.management.sys

Object Explorer

Connect > ACER-VISHWA\SQLEXPRESS01 (SQL Server 11) >

Databases System Tables Database Snapshots inventory.management\_system Database Diagrams Tables System Tables FileTables External Tables Graph Tables dbo.customer dbo.invoice dbo.login dbo.product dbo.stock dbo.vendor Views External Resources Synonyms Programmability Query Store Service Broker Storage Security

Results Messages

```
select * from vendor;
```

	fname	lname	vendor_id	email_id	product_id	cust_id
4	harry	singh	75071	harry@gmail.com	53028	57317
5	harry	singh	75071	harry@gmail.com	14270	58462
6	harry	singh	75071	harry@gmail.com	59854	63698
7	harry	singh	75071	harry@gmail.com	98390	63698
8	ramesh	sharma	40101	ramesh@gmail.com	59854	33295
9	ramesh	sharma	40101	ramesh@gmail.com	15292	33295
10	ramesh	sharma	40101	ramesh@gmail.com	59854	33295
11	ramesh	sharma	40101	ramesh@gmail.com	14270	22150
12	ramesh	sharma	40101	ramesh@gmail.com	59854	22150
13	ram	c	70978	ram@gmail.com	53028	76443
14	ram	c	70978	ram@gmail.com	59854	76443
15	rangeeta	s	94138	rangeeta@gmail.com	59854	45406
16	rangeeta	s	94138	rangeeta@gmail.com	45124	26864
17	rangeeta	s	94138	rangeeta@gmail.com	98390	45406
18	rakesh	sharma	29690	rakesh@gmail.com	81010	43143
19	rakesh	sharma	29690	rakesh@gmail.com	15292	43143
20	vishwa	mehta	73660	vis@gmail.com	59854	58462
21	vismaya	r	84992	vismaya@gmail.com	NULL	NULL
22	neeta	sharma	40226	neeta@gmail.com	NULL	NULL
23	Mehul	Mehta	74044	msm124@yahoo.c...	59854	13261
24	vishwa	mehta	73660	vis@gmail.com	53028	57652
25	viniti	agra...	91639	viniti@gmail.com	NULL	NULL
26	vishwa	mehta	73660	vis@gmail.com	53028	57652
27	vishwa	mehta	73660	vis@gmail.com	53028	57652

Query executed successfully.

ACER-VISHWA\SQLEXPRESS01 (1...) ACER-VISHWA\Vishwa (52) inventory.management\_s... 00:00:00 27 rows

Ln 1 Col 1 INS

Acer-Vishwa\SQLEXPRESS01.inventory\_management\_system - dbo.vendor - Microsoft SQL Server Management Studio

File Edit View Project Table Designer Tools Window Help

New Query Execute

inventory.management.sys

Object Explorer

Connect > Acer-Vishwa\SQLEXPRESS01 (SQL Server 11) >

Databases System Tables Database Snapshots inventory.management\_system Database Diagrams Tables System Tables FileTables External Tables Graph Tables dbo.customer dbo.invoice dbo.login dbo.product dbo.stock dbo.vendor Views External Resources Synonyms Programmability Query Store Service Broker Storage Security

SQLQuery1.sql - A\_VISHWA\Vishwa (52)\*

Column Name	Data Type	Allow Nulls
fname	nvarchar(50)	<input type="checkbox"/>
lname	nvarchar(50)	<input type="checkbox"/>
vendor_id	int	<input type="checkbox"/>
email_id	nvarchar(50)	<input type="checkbox"/>
product_id	int	<input checked="" type="checkbox"/>
cust_id	int	<input checked="" type="checkbox"/>

Column Properties

(General)

- Name: fname
- Allow Nulls: No
- Data Type: nvarchar
- Default Value or Binding:
- Length: 50

Table Designer

(General)

## Task 2: Explain plans

(a) Table scan:

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

inventory\_management\_sy... Execute

Object Explorer

Connect ▾

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    - dbo.login
    - dbo.product
    - dbo.stock
    - dbo.vendor
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SQLQuery1.sql - A...\VISHWA\Vishwa (52)\*

```
select * from customer;
```

Table Scan

Scan rows from a table.

Physical Operation	Table Scan
Logical Operation	Table Scan
Estimated Execution Mode	Row
Storage	RowStore
Estimated I/O Cost	0.0032035
Estimated Operator Cost	0.0032952 (100%)
Estimated CPU Cost	0.0000917
Estimated Subtree Cost	0.0032952
Estimated Number of Executions	1
Estimated Number of Rows for All Executions	12
Estimated Number of Rows Per Execution	12
Estimated Number of Rows to Be Read	12
Estimated Row Size	182 B
Ordered	False
Node ID	0

Object

[inventory\_management\_system].[dbo].[customer]

Output List

[inventory\_management\_system].[dbo].[customer].cust\_id,  
[inventory\_management\_system].[dbo].[customer].phone\_no,  
[inventory\_management\_system].[dbo].[customer].cust\_email\_id,  
[inventory\_management\_system].[dbo].[customer].cust\_name,  
[inventory\_management\_system].[dbo].[customer].str\_no,  
[inventory\_management\_system].[dbo].[customer].str\_name,  
[inventory\_management\_system].[dbo].[customer].pincode

R-VISHWA\Vishwa (52) inventory\_management\_s... 00:00:00 0 rows

Ready

(b) Non-clustered Index Scan:

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

inventory\_management\_sy... Execute

Object Explorer

Connect ▾

ACER-VISHWA\SQLEXPRESS01 (SQL Server 11)

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    - System Tables
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    - Graph Tables
    - dbo.customer
      - Columns
        - cust\_id (int, not null)
        - phone\_no (bigint, not null)
        - cust\_email\_id (nvarchar(50), not null)
        - cust\_name (nvarchar(50), not null)
        - str\_no (tinyint, null)
        - str\_name (nvarchar(50), null)
        - pincode (int, null)
      - Keys
      - Constraints
      - Triggers
      - Indexes
        - nc\_idx\_customer\_table (Non-Unique)

SQLQuery1.sql - A...\VISHWA\Vishwa (52)\*

```
select phone_no from customer;
```

Index Scan (NonClustered)

Scan a nonclustered index, entirely or only a range.

Physical Operation	Index Scan
Logical Operation	Index Scan
Estimated Execution Mode	Row
Storage	RowStore
Estimated I/O Cost	0.0032952 (100%)
Estimated Operator Cost	0.003125
Estimated Subtree Cost	0.0032952
Estimated CPU Cost	0.0001702
Estimated Number of Executions	1
Estimated Number of Rows to be Read	12
Estimated Number of Rows for All Executions	12
Estimated Number of Rows Per Execution	12
Estimated Row Size	15 B
Ordered	False
Node ID	0

Object

[inventory\_management\_system].[dbo].[customer].

Output List

[inventory\_management\_system].[dbo].[customer].phone\_no

VISHWA\Vishwa (52) inventory\_management\_s... 00:00:00 0 rows

Ready

(c) Clustered Index Scan:

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

```
File Edit View Query Project Tools Window Help
File Connect Object Explorer
SQLQuery1.sql - A...ISHWA\Vishwa (52)* Execute
select * from customer;
```

**Clustered Index Scan (Clustered)**  
Scanning a clustered index, entirely or only a range.

**Physical Operation** Clustered Index Scan  
**Logical Operation** Clustered Index Scan  
**Estimated Execution Mode** Row  
**Storage** RowStore  
**Estimated I/O Cost** 0.003125  
**Estimated Operator Cost** 0.0032952 (100%)  
**Estimated CPU Cost** 0.0001702  
**Estimated Subtree Cost** 0.0032952  
**Estimated Number of Executions** 1  
**Estimated Number of Rows for All Executions** 12  
**Estimated Number of Rows Per Execution** 12  
**Estimated Number of Rows to Be Read** 12  
**Estimated Row Size** 182 B  
**SELECT** Clustered Index Ordered False  
**Cost:** 0 % Node ID 0

**Object**  
[inventory\_management\_system].[dbo].[customer].[PK\_customer]  
**Output List**  
[inventory\_management\_system].[dbo].[customer].cust\_id,  
[inventory\_management\_system].[dbo].[customer].phone\_no,  
[inventory\_management\_system].[dbo].[customer].cust\_email\_id,  
[inventory\_management\_system].[dbo].[customer].cust\_name,  
[inventory\_management\_system].[dbo].[customer].str\_no,  
[inventory\_management\_system].[dbo].[customer].str\_name,  
[inventory\_management\_system].[dbo].[customer].pincode

HWAVishwa (52) inventory\_management\_s... 00:00:00 0 rows

Query executed successfully.

## Task 3: Indexing using joins

(a) No index on customer and no index on vendor using cross join:

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (53)) - Microsoft SQL Server Management Studio

```
File Edit View Query Project Tools Window Help
File Connect Object Explorer
SQLQuery1.sql - A...ISHWA\Vishwa (53)* Execute
select * from customer, vendor;
```

**Messages 1<sup>st</sup> Execution plan**  
Query 1: Query cost (relative to the batch): 100%  
select \* from customer, vendor

**SELECT** Nested Loops (Inner Join)  
**Cost:** 0 %  
**Table Scan** [customer]  
**Cost:** 36 %  
**Table Scan** [vendor]  
**Cost:** 49 %

Query executed successfully.

Ln 1 Col 32 Ch 32 INS

ACER-VISHWA\SQLEXPRESS01 (1...) ACER-VISHWA\Vishwa (53) inventory\_management\_s... 00:00:00 0 rows

Ready

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

```
File Edit View Query Project Tools Window Help
New Query Execute
inventory_management_sy... Nested Loops
select * from customer, vendor;
```

**Nested Loops**

For each row in the top (outer) input, scan the bottom (inner) input, and output matching rows.

Physical Operation	Nested Loops
Logical Operation	Inner Join
Estimated Execution Mode	Row
Estimated Operator Cost	0.0013543 (15%)
Estimated I/O Cost	0
Estimated Subtree Cost	0.0091514
Estimated CPU Cost	0.0013543
Estimated Number of Executions	1
Estimated Number of Rows Per Execution	324
Estimated Number of Rows for All Executions	324
Estimated Row Size	351 B
Node ID	0

**Output List**

```
[inventory_management_system].[dbo].[customer].cust_id,
[inventory_management_system].[dbo].[customer].phone_no,
[inventory_management_system].[dbo].[customer].cust_email_id,
[inventory_management_system].[dbo].[customer].cust_name,
[inventory_management_system].[dbo].[customer].str_no,
[inventory_management_system].[dbo].[customer].str_name,
[inventory_management_system].[dbo].[customer].pincode,
[inventory_management_system].[dbo].[vendor].fname,
```

**Warnings**

No Join Predicate

ACER-VISHWA\Vishwa (52) inventory\_management\_s... 00:00:00 0 rows

INS

(b) Clustered index on customer and no index on vendor:

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (52)) - Microsoft SQL Server Management Studio

```
File Edit View Query Project Tools Window Help
New Query Execute
inventory_management_sy... Nested Loops
select * from customer INNER JOIN vendor on customer.cust_id=vendor.cust_id;
```

**Nested Loops**

Query 1: Query cost (relative to the batch): 100%

```
select * from customer INNER JOIN vendor on customer.cust_id=vendor.cust_id
```

Physical Operation	Cost
SELECT	0 %
Table Scan	31 %
Clustered Index Seek (C...	68 %

**Warnings**

Query executed successfully.

ACER-VISHWA\SQLEXPRESS01 (1...) ACER-VISHWA\Vishwa (52) inventory\_management\_s... 00:00:00 0 rows

Ln 1 Col 61 Ch 61 INS

The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left lists the database structure, including the 'inventory\_management\_system' database. The central pane displays the results of a query:

```
select * from customer INNER JOIN vendor ON customer.cust_id=vendor.cust_id;
```

A tooltip for 'Nested Loops' provides the following information:

**Nested Loops**  
For each row in the top (outer) input, scan the bottom (inner) input, and output matching rows.

The execution plan details are as follows:

Physical Operation	Nested Loops
Logical Operation	Inner Join
Estimated Execution Mode	Row
Estimated I/O Cost	0
Estimated Operator Cost	0.0001129 (1%)
Estimated CPU Cost	0.0001129
Estimated Subtree Cost	0.0108183

Execution plan statistics:

Estimated Number of Executions	1
Estimated Number of Rows Per Execution	24
Estimated Number of Rows for All Executions	24
Estimated Row Size	351 B
Node ID	0

The execution plan diagram shows a 'Nested Loops (Inner Join)' node with an 'Output List' containing columns from both the 'customer' and 'vendor' tables.

(c) Non clustered index on customer and no index on vendor:

The screenshot shows the Microsoft SQL Server Management Studio interface. The Object Explorer on the left displays the database schema, including tables like 'customer' and 'vendor' with their respective columns. The main pane shows a T-SQL query:

```
select * from customer INNER JOIN vendor on customer.cust_id = vendor.cust_id;
```

The 'Execution plan' window at the bottom provides a visual representation of how the query will be executed. It shows a 'SELECT' operator (Cost: 0 %) connected to a 'Nested Loops (Inner Join)' operator (Cost: 1 %). This operator connects to two more 'Nested Loops (Inner Join)' operators (both Cost: 1 %), which then connect to a 'Table Scan [vendor]' operator (Cost: 19 %) and an 'Index Seek (NonClustered) [customer].[idx\_customer\_table]' operator (Cost: 41 %). The 'Messages' tab at the bottom indicates that the query was executed successfully.

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (53)) - Microsoft SQL Server Management Studio

```
File Edit View Query Project Tools Window Help
New Query Execute
inventory_management_sy... Nested Loops
select * from customer INNER JOIN vendor on customer.cust_id = vendor.cust_id;
```

**Nested Loops**  
For each row in the top (outer) input, scan the bottom (inner) input, and output matching rows.

**Physical Operation** Nested Loops  
**Logical Operation** Inner Join  
**Estimated Execution Mode** Row  
**Estimated I/O Cost** 0  
**Estimated Operator Cost** 0.0001003 (1%)  
**Estimated CPU Cost** 0.0001003  
**Estimated Subtree Cost** 0.017838  
**Estimated Number of Executions** 1  
**Estimated Number of Rows Per Execution** 24  
**Estimated Number of Rows for All Executions** 24  
**Estimated Row Size** 351 B  
**Node ID** 0

**Output List**  
SELECT  
Cost: 0 %  
Inner Join  
Cost: 1 %

Inventory\_management\_system].[dbo].[customer].cust\_id,  
Inventory\_management\_system].[dbo].[customer].phone\_no,  
Inventory\_management\_system].[dbo].[customer].cust\_email\_id,  
Inventory\_management\_system].[dbo].[customer].cust\_name,  
Inventory\_management\_system].[dbo].[customer].str\_no,  
Inventory\_management\_system].[dbo].[customer].str\_name,  
Inventory\_management\_system].[dbo].[customer].pincode,  
Inventory\_management\_system].[dbo].[vendor].fname,

Inventory\_management\_system].[dbo].[customer].frame  
Inventory\_management\_system].[dbo].[vendor].frame

Messages Execution plan  
Query 1: Query cost  
select \* from customer  
Nested Loops  
Output List  
SELECT  
Cost: 0 %  
Inner Join  
Cost: 1 %

Query executed successfully.  
Outer References  
Bmk1000

ACER-VISHWA\Vishwa (53) inventory\_management\_s... 00:00:00 0 rows

(d) No index on customer and no index on vendor using inner join:

SQLQuery1.sql - ACER-VISHWA\SQLEXPRESS01.inventory\_management\_system (ACER-VISHWA\Vishwa (53)) - Microsoft SQL Server Management Studio

```
File Edit View Query Project Tools Window Help
New Query Execute
inventory_management_sy... Hash Match (Inner Join)
select * from customer INNER JOIN vendor on customer.cust_id = vendor.cust_id;
```

**Hash Match (Inner Join)**  
Table Scan [customer] Cost: 13 %  
Table Scan [vendor] Cost: 13 %

Messages Execution plan  
Query 1: Query cost (relative to the batch): 100%  
select \* from customer INNER JOIN vendor on customer.cust\_id = vendor.cust\_id

SELECT  
Cost: 0 %

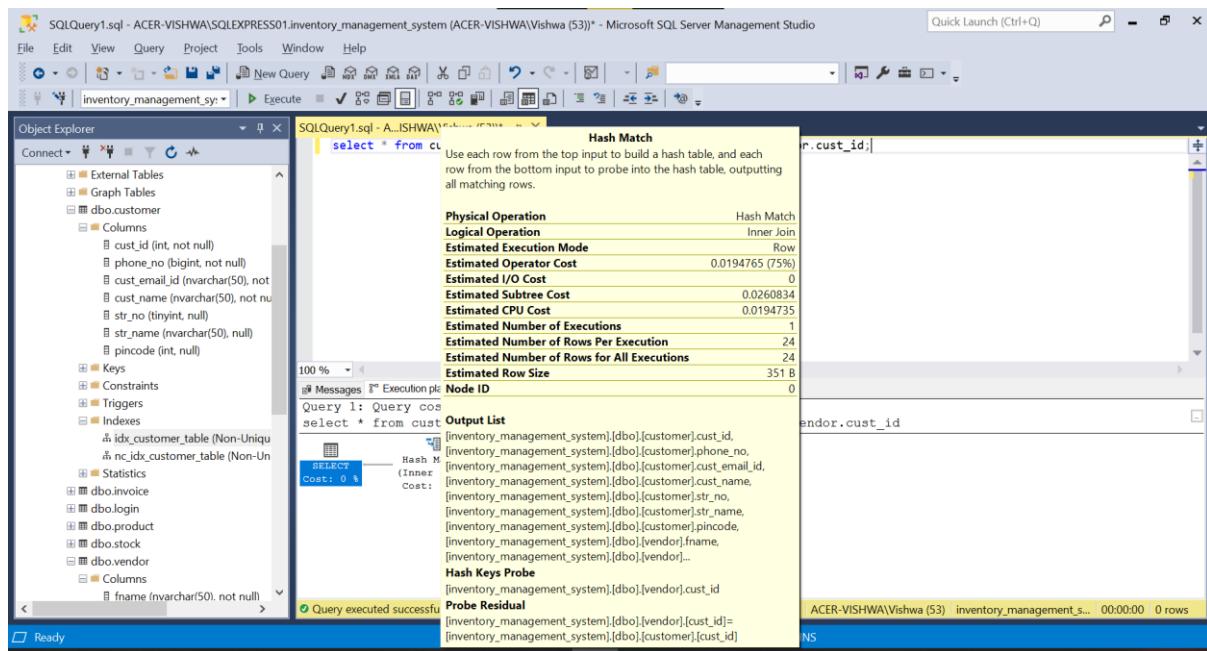
Inventory\_management\_system].[dbo].[customer].cust\_id,  
Inventory\_management\_system].[dbo].[customer].phone\_no,  
Inventory\_management\_system].[dbo].[customer].cust\_email\_id,  
Inventory\_management\_system].[dbo].[customer].cust\_name,  
Inventory\_management\_system].[dbo].[customer].str\_no,  
Inventory\_management\_system].[dbo].[customer].str\_name,  
Inventory\_management\_system].[dbo].[customer].pincode,  
Inventory\_management\_system].[dbo].[vendor].fname,

Inventory\_management\_system].[dbo].[customer].frame  
Inventory\_management\_system].[dbo].[vendor].frame

Messages Execution plan  
Query 1: Query cost (relative to the batch): 100%  
select \* from customer INNER JOIN vendor on customer.cust\_id = vendor.cust\_id

Query executed successfully.

ACER-VISHWA\SQLEXPRESS01... ACER-VISHWA\Vishwa (53) inventory\_management\_s... 00:00:00 0 rows



**Comparison of estimated subtree costs for different join operations and indexes:**

Operation	Estimated Subtree Cost
a) No index - cross join	0.0091514
b) Clustered index – inner join	0.0108183
c) Non clustered index – inner join	0.0178380
d) No index – inner join	0.0260834