Version 1: **Section A: MCQs (1 mark each)**

Q1. B
Q2. C
Q3. A
Q4. A
Q5. B

Section B: Theory (2 marks each)

Q1. Can a table have more than one clustered index? Explain
No, only one clustered index is allowed per table since it physically sorts rows, which can only be done once.

Q2. What needs to be done to create a clustered index on a column other than the primary key?
Primary key must be defined as NONCLUSTERED.

Q3. What is the fundamental unit of data storage in SQL Server?
Page

Q4. What is a heap in SQL Server, and how does it relate to data storage on disk?
A table without a clustered index, where data is stored without any defined order.

Q5. What happens when a query runs on a table without an index?
SQL performs a full table scan, checking every row one by one.

Q6. Precisely explain filtered index. What are sparse columns, and why filtered indexes are helpful on sparse columns
A non-clustered index created on a subset of rows defined by a filter condition. Sparse columns have mostly null values, and filtered indexes are helpful on sparse columns because they index only non-null or relevant values, reducing storage and improving performance.

Version 2: **Section A: MCQs (1 mark each)**

Q1. C
Q2. B
Q3. D
Q4. C
Q5. B

Section B: Theory (2 marks each)

Q1. What is the result of defining a clustered index on a column in a different filegroup?
It moves the table's data to the secondary filegroup.

Q2. What is a covering index? How do you create a covering index?
An index that includes all columns needed by a query, eliminating the need to access the base table. You can create a covering index by including all the columns in the query using INCLUDE keyword.

Q4. What are the two steps to simulate a function-based index using computed columns?

1. Add a computed column based on the expression.
2. Create a nonclustered index on that new computed column.

Q5. Provide up to two main differences between unique index and unique constraint
"unique constraint has no concept of filtered or covering index, and its only applied to the column
Tied to table definition; unique index supports filtered indexes and included columns and it can be included or dropped independent of the table"

Q6. What is the difference between Index Seek and Index Scan?
Index Seek navigates directly to matching records; Index Scan reads the entire index.

Q7. Can a table have multiple non-clustered indexes? Clearly explain your reasoning.
Yes, to improve lookup on those columns using where clause.

Version 3: **Section A: MCQs (1 mark each)**

Q1. B
Q2. C
Q3. B
Q4. B
Q5. B

Section B: Theory (2 marks each)

Q1. Explain the proportional fill strategy with a concrete example
SQL Server fills data files based on their allocated space so they fill up at roughly the same time. For example, if there are 2 data files, one with 100mb, and second with 200mb, then for every 1 extent allocated in first file, 2 are allocated in the second file.

Q2. How can you modify a non-SARGable query to make it SARGable?
Avoid applying functions directly to columns in the WHERE clause.

Q4. What is the key requirement regarding the expression used in a computed column for indexing?
The expression must be deterministic, meaning it always returns the same result for the same set of input values.

Q6. What is the primary purpose of adding included columns to a SQL Server non-clustered index?
To improve query speed by creating an index that contains all columns referenced by a query, thereby reducing disk I/O operations.

Q7. What costly operation does using an index with included columns primarily help to eliminate?
The expensive key lookup operation, which is typically required to retrieve columns missing from the non-clustered index by accessing the underlying table or clustered index.

Version 4: **Section A: MCQs (1 mark each)**

Q1. **B**
Q2. **C**
Q3. **B**
Q4. **C**
Q5. **C**

Section B: Theory (2 marks each)

Q1. To cover queries by including non-key columns and avoid key lookups.

Q2. SARGable queries use indexes efficiently.
DATEDIFF(DAY, HireDate, GETDATE()) = 1000 is non-SARGable because function is applied on column.

Q3. SQL Server creates a non-clustered primary key index since clustered index already exists.

Q4. Eliminates costly key lookups.

Q6. CROSS APPLY

Q7. 1) Create computed column.
2) Create index on computed column.

Verssion 5: Section A: MCQs (1 mark each)

Q1. **B**
Q2. **B**
Q3. **B**
Q4. **A**
Q5. **A**

Section B: Theory (2 marks each)

Q1. To isolate log I/O from data I/O and improve performance and recovery speed.

Q2. Eliminates costly key lookup operation.

Q3. Makes query non-SARGable and prevents index usage.

Q4. Each DML operation must update all indexes, increasing overhead.

Q5. Table data and index pages are stored in that secondary filegroup.

Q6. Heap is a table without a clustered index; data rows are stored in no specific order.