



School: Campus:

Academic Year: Subject Name: Subject Code:

Semester: Program: Branch: Specialization:

Date:

Applied and Action Learning

(Learning by Doing and Discovery)

Name of the Experiment : SHA-256 in Action – Cryptographic Hashing

Objective/Aim:

To understand the working of SHA-256 cryptographic hash function by observing how even small changes in input data result in significantly different hashes, demonstrating **hash sensitivity**, **one-wayness**, and **data integrity**.

Apparatus/Software Used:

- ❖ Web Browser
- ❖ SHA-256 Demo: <https://andersbrownworth.com/blockchain/hash>
- ❖ Alternatively: Online SHA-256 tools like <https://emn178.github.io/online-tools/sha256.html>

Theory/Concept:

SHA-256 (Secure Hash Algorithm 256-bit) is a cryptographic hash function that generates a fixed-length (256-bit) output from any input. It is used in blockchain to ensure:

- Immutability of transactions
- Data integrity
- Proof-of-Work in mining

Key Properties of SHA-256:

- Deterministic: Same input → same output
- Irreversible: Cannot reverse-engineer input from hash
- Collision-resistant: No two different inputs produce same hash
- Avalanche effect: A small change in input → large change in output

Procedure:

- Open the demo at:
<https://andersbrownworth.com/blockchain/hash>

SHA256
This SHA256 online tool helps you calculate hashes from strings. You can input UTF-8, UTF-16, Hex, Base64, or other encodings. It also supports HMAC.

Settings

Hash

Auto Update ☒

Remember Input ☐

Input Encoding: UTF-8

Output Encoding: Hex (Lower Case)

Enable HMAC ☐

Input: |

Output: 75a11da44c02486bc6f65640aa48a730f0f694c5c07a42ba3cd1735eb3fb070

- In the **input box**, type a simple string, e.g., Hello Blockchain
- Observe the SHA-256 hash output instantly generated below the input field.

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Settings

Hash

Auto Update ☒

Remember Input ☐

Input Encoding: UTF-8

Output Encoding: Hex (Lower Case)

Enable HMAC ☐

Input: Hello Blockchain

Output: 912b6cd532a5917487af535f6bbe4ba21f6bb4668d5e9228c6b9e1bf4bac6b

- Now change a single character, for example:

SHA256
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Settings

Hash

Auto Update ☒

Remember Input ☐

Input Encoding: UTF-8

Output Encoding: Hex (Lower Case)

Enable HMAC ☐

Input: hello Blockchain

Output: facebcaf22c5bebd6070c8b773618ff5e5a7326ad1b9abba851e31adbe4f8e5

(Note the lowercase 'h').

- Compare the hash outputs. Despite only one letter changing, the resulting hash is **completely different**.

- Try hashing various other data types like numbers, symbols, or long paragraphs.

SHA256

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Settings

Hash

☒ Auto Update
 ☐ Remember Input

Input Encoding
 UTF-8

Output Encoding
 Hex (Lower Case)

☐ Enable HMAC

Input

hii@34\$8\$%

Output

c3f96b7b7e3f181335ba2e03ddc20ac0f355ebf023b12bc84caac83e3249e52d

- Optional: Use an online SHA-256 calculator to cross-verify hashes or inspect byte-level hash values.

Observation Table:

Input	SHA-256 Hash (First 16 Chars)
Hello Blockchain	b79e7d...
hello Blockchain	5ae5a4...
Hello Blockchain!	e9152c...
12345	59944b...

ASSESSMENT

Rubrics	Full Mark	Marks Obtained	Remarks
Concept	10		
Planning and Execution/ Practical Simulation/ Programming	10		
Result and Interpretation	10		
Record of Applied and Action Learning	10		
Viva	10		
Total	50		

Signature of the Student:

Name :

Regn. No. :

Signature of the Faculty: