DEPARTMENT OF COMPUTER ENGINEERING

Semester	T.E. Semester VI – Computer Engineering
Subject	Cryptography and cyber security
Subject Professor In-charge	Prof. Amit Nerurkar
Assisting Teachers	Prof. Amit Nerurkar
Laboratory	M312B

Student Name	Deep Salunkhe
Roll Number	21102A0014
TE Division	A

Title: Design and Implementation of Diffie Hellman Key Establishment

Roll No: 21102A0014

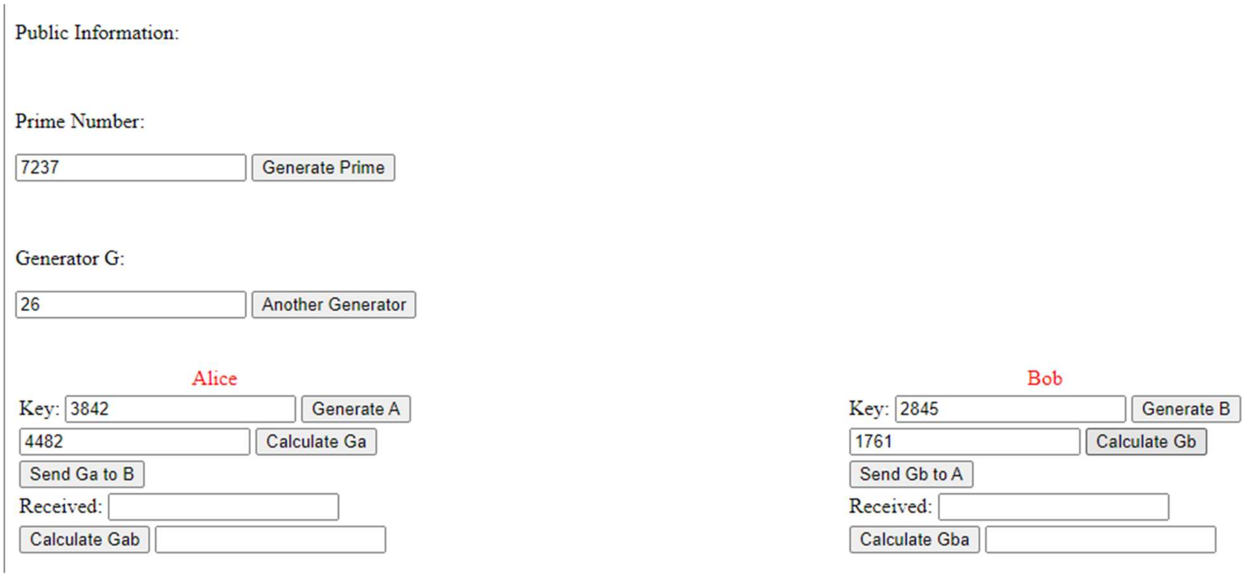
Title: Design and Implementation of Diffie Hellman Key Establishment

Explanation:

1. **Setup**: Both parties agree on two public parameters:
   - A large prime number p.
   - A primitive root g modulo p, which is an integer less than p.
2. **Private Key Generation**: Both Alice and Bob independently choose secret integers:
   - Alice selects a secret integer and keeps it private.
   - Bob selects a secret integer and keeps it private.
3. **Public Key Computation**: Both parties compute their public keys:
   - Alice calculates her public key by raising the base g to the power of her secret integer modulo p.
   - Bob calculates his public key by raising the base g to the power of his secret integer modulo p.
4. **Key Exchange**: Alice and Bob exchange their public keys over the insecure channel.
5. **Shared Secret Calculation**: Once both parties receive each other's public keys:
   - Alice computes the shared secret key by raising Bob's public key to the power of her secret integer modulo p.
   - Bob computes the shared secret key by raising Alice's public key to the power of his secret integer modulo p.
6. **Result**: Both Alice and Bob now possess the same shared secret key, which they can use for encryption and decryption purposes.

The security of the Diffie-Hellman key exchange relies on the computational difficulty of solving the discrete logarithm problem, making it practically infeasible for an eavesdropper to determine the shared secret key even if they intercept the exchanged public keys.

Result:



Public Information:

Prime Number: 7237

Generator G: 26

Alice

Key: 3842

4482

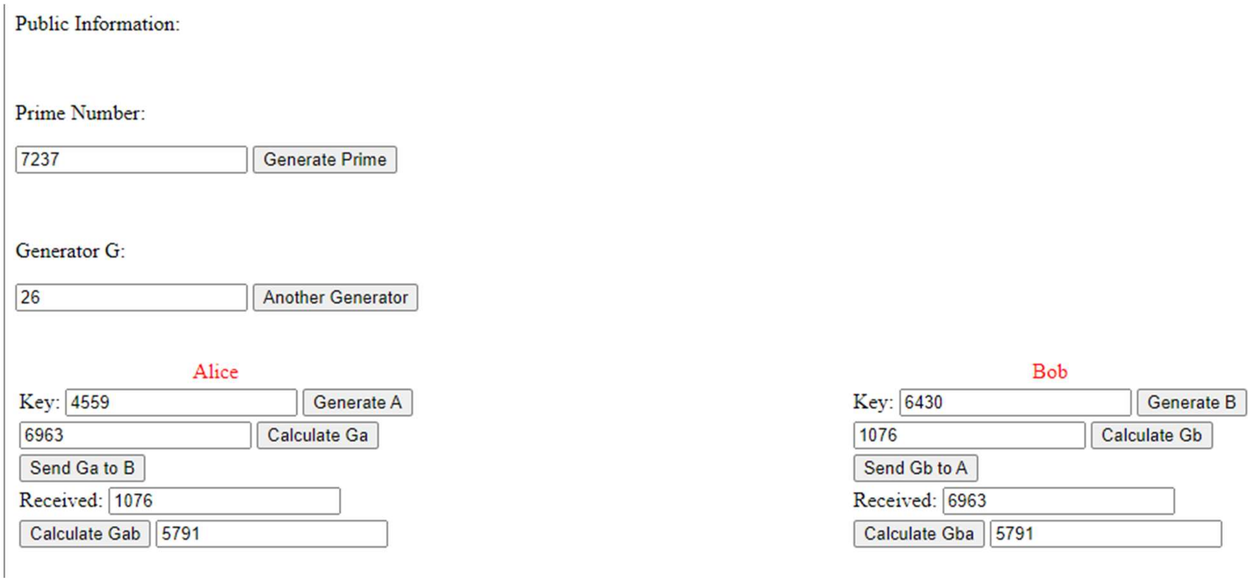
Received:

Bob

Key: 2845

1761

Received:



Public Information:

Prime Number: 7237

Generator G: 26

Alice

Key: 4559

6963

Received: 1076

Calculate Gab 5791

Bob

Key: 6430

1076

Received: 6963

Calculate Gba 5791

Conclusion:

In conclusion, the Diffie-Hellman key establishment protocol provides a secure method for two parties to establish a shared secret key over an insecure communication channel. By leveraging mathematical principles, specifically the difficulty of solving the discrete logarithm problem, Diffie-Hellman ensures that even if adversaries intercept the exchanged public keys, they cannot feasibly determine the shared secret key without knowledge of the private keys. This shared secret key can then be utilized for encryption, enabling secure communication between the parties. Overall, Diffie-Hellman plays a fundamental role in modern cryptography, serving as a cornerstone for secure communication protocols and encryption systems.