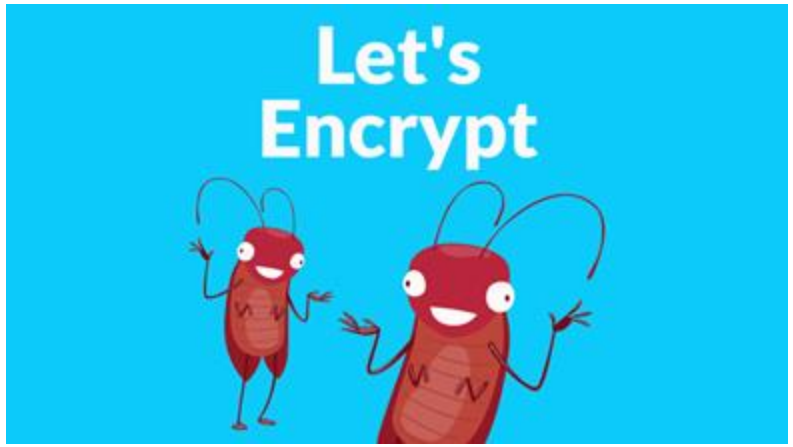
Computer Security (COM-301)

Applied cryptography I

OTP is the best?



Agree or disagree and justify :

“A One Time Pad is the best choice to transmit a secret document of 10Mb because we know it provides perfect secrecy”

Secure streaming

Is the following pseudocode for a function to encrypt movies a secure use of a stream cipher? Justify your answer.

```
var iv = "bestidever“

def EncryptMovie(movie):
      key = GenerateSecureRandomKey() // generates a truly random key
      secureKeyTransfer(key)  // securely sends the key to the
                              // recipient
      EncryptedMovie = Salsa20(key,iv,movie)    // uses Salsa20 stream
                                                // cipher
      return(EncryptedMovie)
```

Key exchange

Alice and Bob want to derive a shared secret using the Diffie-Hellman protocol. Alice will use this shared secret as a key to symmetrically encrypt a message ***m*** to Bob so that no one but Bob knows what she says to him. All in all, their protocol goes as follows.

1) The public parameters are the modulus ***p*** and the generator ***g***.
2) Alice chooses a large secret number ***x*** and sends $g^x \pmod p$ to Bob.
3) Bob chooses a large secret number ***y*** and sends $g^y \pmod p$ to Alice.
4) After deriving the shared secret $sk = g^{xy} \pmod p$, Alice uses it as a key to encrypt the message ***m*** to a ciphertext $c = Enc(sk, m)$ and sends ***c*** to Bob.

What Alice and Bob are not aware of is that Mallory eavesdrops on all their communication and can tamper with the messages they send to each other (Mallory can substitute any of their messages with an arbitrary string).

Describe an attack in which Mallory achieves both of the following goals:

1) learns Alice's message ***m***, and then
2) makes sure that instead of Alice's message, Bob reads another message ***m'*** of Mallory's choosing.

Both 1) and 2) have to be done in such a way that Mallory is not detected (that is, from the point of view of Alice and Bob, the protocol goes normally).