The University of Newcastle
School of Electrical Engineering and Computer Science

COMP3260 Data Security

GAME 5

4th April 2019

Number of Questions: 5
Time allowed: 50min
Total marks: 5

In order to score marks you need to show all working/reasoning and not just the end result.

	Student Number	*Student Name*
Student 1		
Student 2		
Student 3		
Student 4		
Student 5		
Student 6		
Student 7		

Question 1	Question 2	Question 3	Question 4	Question 5	Total

1. In a running key cipher, the key is as long as the plaintext. The key is often a text from a well-known book (e.g. chapter 5, paragraph 3 of "To Kill a Mockingbird"). Is such a system equivalent to a one-time pad (achieves perfect secrecy)?

- If so, outline why it is impossible to gain any knowledge about the contents of the plaintext regardless of how much is intercepted.
- If not, state at least one difference between a running key cipher and a one-time pad, and outline a possible approach to attacking a running key cipher.

Assume, if necessary, that the attacker is able to mount a chosen plaintext attack – that is, the attacker can put a chosen new plaintext through the system and obtain the corresponding ciphertext.

2. Estimate the unicity distance of a monoalphabetic substitution cipher, assuming that all keys are equally likely.

3. How many different encipherments can you get with a Rotor machine with 6 rotors? (Rotor machine has 26 input pins on front and 26 output pins on back)

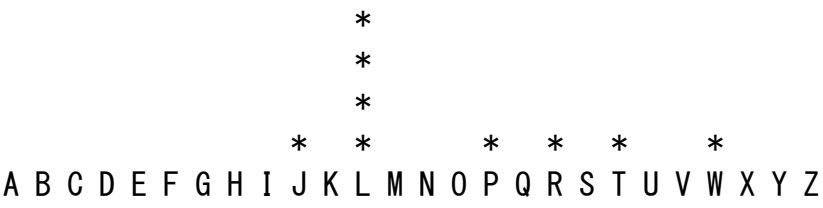
4. A famous example of a rotor machine is Enigma, which was used by the Germans in World War II. What were some of the factors that enabled the Allies to break Enigma?

5. The following ciphertext was produced using a Vigenere cipher with 4 alphabets:
RMLKLCFXPAGALMAXTGBYWMEYLKGLLKEXJG

The frequency analysis is displayed below. Find the plaintext and the key.

Graphing Frequency Counts for 4 alphabets.

Graphing alphabet 0



Graphing alphabet 1

Graphing alphabet 2

Graphing alphabet 3