**CSC 1500 – Homework 5**

**(1)** For the following, assume these equations, and work out the resulting equations. (*5 pts. each*)

f(x) = x-5 g(x)=x/3 h(x) = 2x-7

INVERSES: f(x) = x+5, g(x) = 3x, h(x) = h(x) = (x+ 7)/2

(1.1) f(g(x))

F(x/3) = (x/3) - 5

(1.2) g-1(f-1(17))

(17+5)\*3 = 66

(1.3) h-1(x)

(x+7)/2

(1.4) f(h(3))

((2\*3)-7) = -1

-1 -5 = 6

**(2)** Use the Euclidean Algorithm method to find the GCF and LCM of the follow numbers. DON’T FORGET TO PUT BOTH NUMBERS FOR EACH. *(5 pts. each)*

(2.1) (156,195)

195/156= 1 R 39

156/39 = 4 R 0 -> Greatest Common Divisor is 39

(156\*195)/39 = 780 = Least Common Multiple

(2.2) (116, 348)

348/116 = 3 -> Greater Common Divisor is 116

(116\*348)/116 = 348 = Least Common Multiple.

**(4)** Determine if the following piece of Hamming Code has an error. If it does, list the error’s location, correct it, then give the decimal number transmitted by the code. (*20 pts.*)

1110010

1234567

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S1 | S2 | M3 | S4 | M5 | M6 | M7 |
| 1 | 1 | 1 | 0 | 0 | 1 | 0 |
| 1 | 1 | 1 | 0 | 0 | 0 | 0 |

(1 + 1 + 0 + 0) % 2 = 0 \* 1 = 0

(1+1+1+0)%2 = 1 \* 2 = 2

(0 + 0 + 1 + 0)%2 = 1\*4 = 4

ERROR AT M6

Correction:

1110000

M = 1000 = 8

**(3)** Decrypt the following Shift cipher using this decryption f(p) = (p+4)mod 26. (*10 pts.*)

PNEYGU PATP PSEOPO

Slapped this bad boy into the lab we created, it was in the 5th row.

TRICKY TEXT TWISTS

**(4)** Decrypt the following Vigenere cipher. Your key is ‘taco’. (*20 pts.*)

20 1 3 15

YIPR MHG GXCTSM

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Y | I | P | R | M | H | G | G | X | C | T | S | M |
| 25 | 9 | 16 | 18 | 13 | 8 | 7 | 7 | 24 | 3 | 20 | 19 | 13 |
| 20 | 1 | 3 | 15 | 20 | 1 | 3 | 15 | 20 | 1 | 3 | 15 | 20 |
| 5 | 8 | 13 | 3 | -7 | 7 | 4 | -8 | 4 | 2 | 17 | 4 | -7 |
| F | I | N | D | T | H | E | S | E | C | R | E | T |

I just realized I was supposed to index the alphabet at 0 instead of 1. Is this why indexing starts at 0? So the modulus function can be used properly? Despite indexing the letters wrong initially, this caused no issues as I used negative numbers to account backwards.

FIND THE SECRET

**(5)** Frequency Crack Cryptography: The following is an encrypted piece of a well-known poem by Edgar Allan Poe. This cryptographic alphabet is not in sequence, meaning its key is not simply a number, but rather a scrambled up alphabet.

QUOTH THE RAVEN NEVERMORE

WEGRQ RQZ NYFZA AZFZNUGNZ

Key contains letters: A E H M N O Q R T U V

Key Pair Contains: Y (BCD) Z (FG) Q (IJKL) U A G (P) W N (S) R E F (WXYZ)

YBCDZFGQIJKLUAGPWNSREFWXYZ

Using the hint of what the above cryptograph is referring to, and knowing that the following encrypted piece was encrypted with the same alphabet key, see if you can decode this longer message. (*20 pts.*)

Probably something poe related.

RQYR DC AGR BZYB KQDLQ LYA ZRZNAYV VDZ. YAB KDRQ CRNYAIZ YZGAC ZFZA BZYRQ UYP BDZ.

A picture containing text, font, line, diagram

Description automatically generated

Y (BCD) Z (FG) Q D (JKL) U A G (P) W N C R E F (WXYZ)

YBCDZFGQDJKLUAGPWNCREFWXYZ

That is not dead which can eternal lie and with strange aeons even death may die.