**CSC 1500 – Exam 2**

**(1)** Given the following magnitude information about three sets, A, B, and C, solve the following four questions. (*5 pts. each)*

(1.1)

= A – AINTERSECTB = 85 – 28 = 57

(1.2)

A+C – AINTERSECTC = 85 + 72 – 30 = 127

A picture containing text, handwriting, ink, drawing

Description automatically generated

Got too complicated – drew circles. Counted common intersections first, then repeated until all circles filled out.

(1.3) 219

(1.4) 35

**(2)** Take the following scenarios and determine which Big O notation applies to each of them. Then, place them in order from LEAST complex to MOST complex. (*5 pts*. *Each, 10pts. For Order*)

(2.1) A zombie outbreak has occurred. Every zombie is capable of biting two people, turning both of them into zombies as well. Then those two zombies will then each go and bite two more people.

Exponential 2^n

(2.2) You’re attempting to sort a list of numbers by choosing one element in the list to act as a ‘pivot’, splitting the list in half with regards to the pivot, then repeating this process over and over with the smaller halves until the list is sorted.

Linearithmic – quicksort

(2.3) for( int i = 0; i<x;i++) { for(int j = 0; j <x;j++){for(int k=0;k<x;k++){DoALinearThing();}}}

Polynomial – it just is, look at it. For each ‘linear thing’ it is repeated for x^3 times.

(2.4) There’s a crowd of people gathering, and you’ve got to make a lunch for every single one of them.

Linear – one lunch if needed for each person

**LEAST:**

Linear – Lunches

Linearithmic – quicksort

Polynomial – DoALinearThing

Exponential – Zombies

**MOST**

**(3)** For the following incoming Hamming Encoded data, check for errors, then pull out the actual MESSAGE that was sent, and convert the MESSAGE in decimal. (*20 pts.*)

**0110111**

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

**(S1+M3+m5+m7)%2 X1 = (0+1+1+1)%2 = 3%2 = 1\*1 = 1**

**(s2+m3+m6+m7)%2X2 = (1+1+1+1) = 4%2 = 0 \*2 = 0**

**(s4+m5+m6+m7)%2X4 = (0+1+1+1) = 3%2 =1\*4 = 4**

**ERROR IN DIGIT 5**

**CORRECTED MESSAGE: 1011bin = 11dec**

The resulting decimal message will provide the key by which the following shift-cipher was **ENCRYPTED**. Use your knowledge of how it was encrypted, to decrypt it.

**ESPCP LCP YZE PYZFRS DPNCPED EZ DLETDQJ XP**

**ABCDEFGHIJKLMNOPQRSTUVWXYZ**

**LMNOPQRSTUVWXYZABCDEFGHIJL**

**-11.**

**THERE ARE NOT ENOUGH SECRETS TO SATISFY ME**

**(4)** For each of the following equations, and the specifically noted domains and co-domains (input and output sets), determine if the function is One-to-One, Onto, Neither, or Both. *(10 pts. each)*

(4.1) **Domain**: Integers, **Co-Domain**: Integers,

One to one (cubic) – NOT UNTO (ex. No integer cubed is equal to 2)

(4.2) **INPUT**: Integers, **OUTPUT**: Rational,

One-to-one (linear)– NOT UNTO (ex. 1 is rational, but 2x can never = 3.5)

**(5)** Given the following recursively defined sequence, please use the **EXPLICIT FORM** to provide the 12th element in the sequence. *(10 pts.)*

A(1) = 4

A(k) = 2.5\*A(k-1)

= 4\*2.5^(k-1)

= 4\*2.5^(11) = 95367.4316