GE Assignment

Please read the following instructions carefully

A. It is mandatory to attempt all 3 out of the 3 problems given below
B. Part (ii) of problem (II) is optional. You can solve it to gain additional bragging rights!
C. The solution to at least 1 problem must be provided in python
D. The solution to at least 1 problem must be provided in any of the following scripting languages
    a. JavaScript
    b. PowerShell (Linux or Windows)
    c. Shell Script (Linux)
E. The solution (program/script) to each problem must be saved as a file. The name of the file must correspond to the problem number and should have a suitable extension.
    e.g. solution1.py, solution1.ps1 etc.
F. The solution must be uploaded to your Git repository
G. The link to the solution must be shared with GE
H. Any text file created by you to test your program must be uploaded into Git. Alternately, you can create your unit test cases.
I. Make suitable assumptions where needed. Each assumption must be clearly documented in the solution as a code comment.
J. The problems have been listed on the next page

Best of Luck

I. Generic Matrix Operations

Perform the operations listed below on a matrix. The program should work with a matrix of any size.

e.g.

a	b	c	d
e	f	g	h
i	j	k	l
m	n	o	p

All the following operations must be implemented

i. Output column at n^{th} position
   e.g. column at position 3 => c g k o
ii. Output row at n^{th} position
   e.g. row at position 2 => e f g h
iii. Output quadrant at n^{th} position
   Quadrant is defined as a square matrix with 2 rows and 2 columns.
   e.g. quadrant at position 2, 2 => f g j k

II. Simple Encryption (Cipher)

Write a program/script that works on a text file. The program must be able to input a text file (input.txt) with characters and output text based on the following 2 rules. Out of the 2 rules, the first rule is mandatory while the second one is optional.

For simplicity, assume that the input file consists of characters and spaces only. You can also assume that the text file will be large and will include every letter in the English language.

e.g text in input file input.txt => a quick brown fox jumps over the lazy dog

i. Rule for consonant
   Each letter must be shifted by 3.
   e.g. A would become D, B would become E, Y would become B and so on.
ii. Rule for vowel (optional)
   Each vowel must be replaced with one or more numbers. The rule for determining the number is as follows
   a. A gets replaced with 1 or 6 or (11) or (16) …
   b. E gets replaced with 2 or 7 or (12) or (17) …
   c. I gets replaced with 3 or 8 or (13) or (18) …
   d. O gets replaced with 4 or 9 or (14) or (19) …
   e. U gets replaced with 5 or 10 or (15) or (20) …
   f. The number of occurrences of any number must not exceed the number of occurrences of the most commonly occurring consonant in the input text.
      e.g.
      ABC => 1EF
      AABC => 16EF
      AAABC => 16(11)EF

AABBC => 11EEFF (most commonly occurring consonant in this example is B which occurs 2 times. Notice that '1' does not occur more than 2 times.)

III. Text analysis

Create a program that can perform the following operations on any text provided as input. The program/script must be as generic as possible.

i. No of characters
   Output the number of readable characters in the input text.
   e.g. aaaA bbcd => 9

ii. No of words
   Output the number of words in the input text. For simplicity, you can assume that a word is defined as a group of characters that are separated from the other group of characters with a space.
   e.g. aaaA bbcd => 2

iii. No of alphabets
   Output the number of characters in the input text that are alphabets.
   e.g. aaaA bbcd => 8

iv. No of times the most commonly occurring alphabet occurs
   e.g. aaaAbbcdD => 4 (letter 'A' occurs 4 times)