COMPUTER PROGRAMMING

ASSIGNMENTS 07-WEEK 08 (DEADLINE: 04 FEB 2021, 06:30 PM) CODE: assign07-w8

NOTES: You must use gcc compiler under Ubuntu OS

i) Please carefully read all assignment problems and answer in the same c file.
ii) Create a .c file by strictly following the file naming convention: If the last 4 digits of your roll number is 0171 & code is assign07-w8, then the file name should be assign07-w8-0171-AYCOY.c where AYCOY can be any five capital letters of your choice and this could act as your secret key (do not share this with others).
iii) If you do not follow the above instruction, a suitable penalty would be imposed.
iv) Questions: 1 – 6 are compulsory and 7th Question is optional and it is of course a bonus question. In order to attempt the 7th question, you must have completed the first 6 questions.

ASSIGNMENT PROBLEMS **[Total Marks: 30 + 10]**

1) **[Marks: 3]** Consider all integers in the given interval [20, 70]. Write a function to return the number of even integers that are divisible by a random number k, where $1 \leq k \leq 20$. Here an integer x is divisible by k is defined as: $x \equiv 0 \pmod{k}$.
2) **[Marks: 3]** Write a function to check whether the given string is an even length palindrome or not? This function should print the status of the given string as either "Odd Length Palindrome" or "Even Length Palindrome" or "Not a Palindrome" and return the size of the palindrome.
   [Hint: "LIRIL" is an odd length palindrome and "XYYX" is an even length palindrome]
3) **[Marks: 5]** Consider two strings S_1 and S_2 of different size (Each string may have more than 20 characters) and write to function to find all substrings of S_1 of length at least k (Here k can be randomly chosen in the interval (2, 7)) that appears in the same order in another string S_2.
4) **[Marks: 4]** Generate an array of n integers (choose $n \in [30, 70]$) randomly. You may use rand() function for his purpose. Now write functions to find (a) the largest odd number, (b) the largest even number and (c) the greatest common divisor (GCD) of these two numbers.
5) **[Marks: 8]** Take an array of 25 integers as given below:

2	15	7	6	3	8	22	41	23	4	18	13	5	27	47	12	11	23	10	9	7	21	30	28	8

Now write functions to find the sum of a pair of prime numbers whose sum is also present in the array. To do this task, you may do the following:
   a) Write a function to take the first prime number that appears in the array and find the next prime number subsequent to the first one. Add their sum and check whether the sum is present in the array or not? (Hint: Here 3 and 5 are subsequent prime numbers and their sum (= 8) is also present in the array)
   b) Repeat the same for all pairs of prime numbers in the array and print the pairs of subsequent prime number and their sum.

6) **[Marks: 7]** Assume the following integer array:

1	3	4	5	6	2	3	8	7	6	5	4	3	1	3	4	2	5	1	8	9	4	3	1	3	3	2	6	7	8

Find a sub-array of length 3 whose reverse order can also be found in the same array. For example, the sub-array 4 5 6 appears as 6 5 4 (found in the same array). Print the start and end positions of all such sub-arrays and its reverse order in the array.

7) **[Marks: 10 – Bonus Question (Optional)]** Assume a square matrix of order n (n can be assumed in [5, 8]) and store them as a one-dimensional array A. Now using random number generator, generate integers in [10, 30] for values of A. Now the task is to find the following:
   a) Write a function to find a sub-matrix of order 3 of A, whose center element is an even number. Inputs to this function would be:
      i) One-dimensional array A
      ii) The index k, the starting index of the square matrix of order 3.
      iii) Find all such sub-matrices and print the same.
   b) Write a function to compute row and column sum of such sub-matrices & print the same.

[Hint: Use the trick: the array index of any element can be used to derive row and column index of a square matrix of order 3. Let A be a square matrix of order 5. An element at A[7] can be seen as A[1][2]. Use this to find sub-matrices.]