FACULTY OF COMPUTER SCIENCE AND ENGINEERING

Ghulam Ishaq Khan Institute of Engineering Sciences and Technology, Topi

Lab Duration: 60 minutes.   **CS102L – Intensive Programming**   **Marks: 25**

Open-Ended Lab.   **Instructor: Engr. Hayat Ullah**   **Dated:25/05/2022**

Pandas Tasks:

1. Read the provided CSV files and answer the following question. Each answer is based on python code. Answer without code will get zero: (2)
   i. When did Pakistan get its first COVID-19 confirmed case? (3)
   ii. If the current population of Pakistan is 220 Millions, what percentage of Pakistanis suffered from COVID-19 so far? (2)
   iii. Which state/province of UK suffered from COVID the most? (3)

Numpy Tasks:

2. Write python code solve the following system of linear equations: (4)

$$\begin{cases} 4x + 2y + z = 15 \\ x + y + z = 6 \\ x + y + 4z = 12 \end{cases}$$

$$\Rightarrow \begin{bmatrix} 4 & 2 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 4 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 15 \\ 6 \\ 12 \end{bmatrix}$$

$$\Rightarrow AX = B \Rightarrow X = A^{-1}B$$

Hint: np.dot() can be used for matrix multiplication and np.linalg.inv() for matrix inversion.

Object Oriented Programming (OOP):

3. Declare a class called student having instance variables Name, RegNo and PythonScore. If a class has 10 students, declare a method that evaluate average of PythonScore of the class. (3)
4. What is the solution if we have to add Nationality to the student class without editing student class? Please code your solution. (2)

Functions:

5. Propose a python function based solution that takes three arguments, displacement and velocity at time 0 i.e. x(0), v(0) and time t, as input and return displacement at t i.e. x(t): (6)

$$a(t) = \frac{dv(t)}{dt} = t^3 e^{-2t}$$

$$v(t) = \frac{dx(t)}{dt}$$

Take $\delta t = 10^{-4}$

Hint: $\frac{dy}{dt} \approx \frac{y(t+\delta t) - y(t)}{\delta t}$. You may solve for velocity and then for displacement.