CSC213: COMPUTER PROGRAMMING II
TEST 2
Date: Wednesday 11 December 2024
Time : 8 – 10 am

PROBLEM:

The South African Administrative structure is divided into 3 levels, namely: Provinces (ADM1), District Municipalities (ADM2) and Local Municipalities (ADM3). The following datasets are provided:

1. **province.txt** – contains administrative level 1 (ADM1) provincial information. The data includes province code (PCODE) id (PID) and name (PNAME) of each of the 9 provinces in South Africa.
2. **district.txt** – contains administrative level 2 (ADM2) district municipality information. The data includes the province code (PCODE), district id (DID) and district name (DNAME) and the 2019 projected population of females and males. There are 52 unique observations in this dataset.

A sample of each of the data files is shown below:

province.txt

PCODE	PID	PNAME
ZA1	WC	Western Cape
ZA2	EC	Eastern Cape
ZA3	NC	Nothern Cape
ZA4	FS	Free State
ZA5	KZN	KwaZulu-Natal
ZA6	NW	North West
ZA7	GT	Gauteng
ZA8	MP	Mpumalanga
ZA9	LIM	Limpopo

district.txt

PCODE	DID	DNAME	Female	Male
ZA2	BUF	Buffalo_City	403432	381679
ZA1	CPT	City_of_Cape_Town	2198114	2140956
ZA1	DC1	West_Coast	233200	232785
ZA2	DC10	Cacadu	240298	240168
ZA2	DC15	O.R.Tambo	733990	637689
ZA4	DC16	Xhariep	77053	74405
ZA1	DC2	Cape_Winelands	480965	473884
ZA4	DC20	Fezile_Dabi	255396	254525
ZA5	DC22	Umgungundlovu	604198	553269
ZA5	DC24	Umzinyathi	292654	249033
ZA8	DC32	Ehlanzeni	954170	856870

Notes: Assume male and female population count are integers, and all other attributes are single one word/strings.

YOUR TASK:

Your task is to write a program that extracts data for each province and generate a report as explained in questions that follow.

QUESTION 1 – 10 Marks

Using C++ notation

a. Define a struct called **Province** that can be used to store the province attributes. [3]
b. Define an overloaded extraction operator that extracts the province attributes from a given input stream to a parameter of type Province. [3]
c. Write an overloaded insertion operator that takes a parameter of type Province and writes the province attributes to a given output stream in the following format: [4]

```
Province ID       : ----------
Province code     : ----------
Province name     : ------------------------------
```

QUESTION 2 – 6 marks

Using C++ notation

a. Define a struct called **District** that can be used to store the district attributes. [2]
b. Define an overloaded extraction operator that extracts the district attribute values from a given input stream to a parameter of type District. [2]
c. Write an overloaded insertion operator that takes parameter of type District and writes the attribute values (in a single line) to a given output stream (see format in question 3). *You will note that the province code is not required in the report.* [2]

QUESTION 3 – 40 marks (*question marked out of 40)*

Using the structures and operators defined in QUESTIONS 1 and 2, write a C++ function that repeatedly reads each province's details from the province.txt data file, and extract all matching district information for that province as shown below. The function takes the names of the two data files as parameters/arguments. The TOTAL, AVERAGE and GENDER RATIO are calculated values. The GENDER RATIO refers to the ratio of population of males to the population of females.

```
Province ID       : ----------
Province code     : ----------
Province name     : ------------------------------
*********************************************************************************
DID    DNAME                #MALES        #FEMALES    GENDER_RATIO
*********************************************************************************

------    ----------------     ------------     -------------    -.--
------    ----------------     ------------     -------------    -.--
------    ----------------     ------------     -------------    -.--
------    ----------------     ------------     -------------    -.--
=========================================================
TOTAL POPULATION       ------------     -------------
AVERAGE POPULATION     ------------     -------------
=========================================================
```

QUESTION 4 - 4 marks

Write a C++ main function that calls the function defined in Question 3 above.