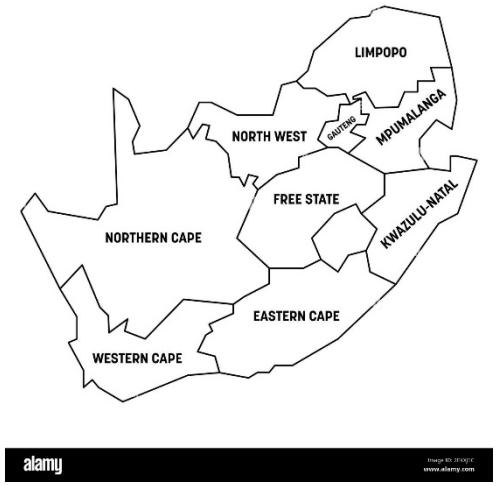
CPSC 4420/6420: ARTIFICIAL INTELLIGENCE

Q7-INCLASS NAME:

Consider MAP coloring problem for South Africa, and let's use the following abbreviations for 9 provinces for brevity.

Note: Skip the middle part. It is Lesotho, another country.

1. EC: Eastern Cape
2. FS: Free State
3. GG: Gauteng
4. KN: KwaZulu-Natal
5. LP: Limpopo
6. MP: Mpumalanga
7. NC: Northern Cape
8. NW: North West
9. WC: Western Cape



Ignore the small islands.

We are allowed to use three colors "R": Red, "B": Blue, and "G": Green so that neighboring regions do not take the same color. For example, we show assignments as {EC= "R", FS= "B", …..,WC= "G"}.

We follow our common constraint that neighbor states can not take the same color. For example, we can not have NC=WC, or we can not have $NC = \text{"R"}$ and $WC = \text{"R"}$ simultaneously as part of any assignment.

A – Draw the contact graph [2 Points]

B- Is the following assignment consistent with constraints or not? Why? [1 Point]

{ EC = "R", FS = "G", GG = "B", KN = "G", LP = "R", MP = "B", NC = "G", NW = "R", WC = "B"}

C- How many do there exist assignments in total (including consistent and inconsistent assignments)? [1 Point]

D. Consider that we have the following domains for two neighboring states LP: Limpopo and NW: North West. [3 Points]

Domain of LP is {Blue }

Domain of NW is {Blue, Green, Red}

D1. Is LP arc consistent with NW? why?

D2. Is NW arc consistent with LP? Why?

D3. If they are not consistent, how we can alter the domain of NW so both NW and LP become consistent with respect to the other? Write “Not Applicable” if they are already consistent.

From now on consider the map of England with the following 10 regions.

1. S: Scotland
2. N: Northern
3. YH: Y+H: Yorkshire and the Humber
4. NW: North West
5. W: Wales
6. WM: West Midlands
7. EM: East Midlands
8. SW: South West
9. EA: East Anglia
10. SE: South East

E- Complete the following assignment by assigning colors to blank states until all regions take some color. When there is more than one option you can take any of them (for this part). Is it possible to complete this assignment? Why?

[1 Points]

{S =”?”, N =”?”, YH=”B”,NW=”?”,W=”?”,WM=”?”,EM=””, SW=”B”, EA=”R”, SE=”?”}

F- For the above problem, using the most constrained variable, which region you would select next (to assign a color) after the three states YH, EA, SW. Explain why? [1 Points]

G- Now, consider the following situation. If we select “Wales” after the three states EA=”Red”, SE=”Green”, SW=”Blue”. What color [s] would you assign to it. Explain why? [1 Points]