### Course: CS420 - Artificial Intelligence

03 – Constraint Satisfaction Problems

**Question 1.** You are designing a menu for a special event. The menu includesfour dishes, each of which is a variable: **(A)**ppetizer, **(B)**everage, main **(C)**ourse, and **(D**)essert.

The domains of the variables are as follows:

**A:** **(v)**eggies, **(e)**scargot

**B: (w)**ater, **(s)**oda, **(m)**ilk

**C: (f)**ish, **(b)**eef, **(p)**asta

**D: (a)**pple pie, **(i)**ce cream, **(ch)**eese

Because all your guests get the same menu, it must obey the following dietary constraints:

(i) Vegetarian options: If you serve the veggies, you must avoid everything made of meat (red meat, poultry, seafood, etc.)

(ii) Dairy products lover: You must serve at least one of milk, ice cream, or cheese.

(iii) Digestible: The main course must be fish, or the beverage must be water or soda.

Formulate the problem as a CSP, stating the variables and corresponding domains.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variables |  |  |  |  |
| Domains |  |  |  |  |

Binary constraints:

|  |  |  |
| --- | --- | --- |
|  |  |  |

|  |  |
| --- | --- |
| Draw the constraint graph associated with your CSP, in which each node represents a variable and an edge connecting two nodes represents the relation between the two variables denoted by these nodes. |  |

Again, imagine we first assign A=v. Cross out eliminated values to show the domains of the variables after arc consistency has been enforced.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variables |  |  |  |  |
| Domains |  |  |  |  |

Give a solution for this CSP or state that none exists.

|  |  |
| --- | --- |
| **Question 2.** You are a map-coloring robot assigned to color the given map. Adjacent regions must be colored a different color (R=Red, B=Blue, G=Green).   1. Draw the constraint graph | A map of the country  Description automatically generated |

1. Find a solution by using backtracking search with appropriate heuristics (MRV, DH, and LCV). Justify your answer.