Thinking Task Week 6: Constraint Solving

The following exercise is taken from an old exam paper. After watching the videos this week, you should be able to solve exercises (a)-(c).

You are in charge of scheduling computer science classes. There are 5 classes that meet on the same 3 days per week, and 3 lecturers who will be teaching these classes. You are constrained by the fact that each lecturer can only teach one class at a time.

The classes are:

- Class 1 – Intro to Programming (8-9am)
- Class 2 – Intro to Artificial Intelligence (8:30 – 9:30 am)
- Class 3 – Theory of Computation (9-10am)
- Class 4 – Discrete Mathematics (9-10 am)
- Class 5 – Embedded Systems (9:30 – 10:30 am)

The lecturers are:

- Dr X – who is available to teach classes 3 and 4.
- Dr Y – who is available to teach classes 2,3,4,5
- Dr Z – who is available to teach classes 1,2,3,4,5

a) Formulate this as a CSP problem in which there is one variable per class. Use only binary constraints.   (4 marks in an exam)

b) Draw the resulting constraint graph (2 marks in an exam)

c) Show the domains of the variables after running the AC-3 algorithm (4 marks in an exam)

d) In the example below, using the UCB formula (given below), where v is the value estimate for the i'th node, C is the tuneable parameter, N is the total number of runs, and n is the number of trials for the i'th node, and assuming a C value of 1.5, which is the next node that would be chosen for expansion? Show your working.

$$v_i + C \: x \: \sqrt{\frac{\ln (N)}{n_i}}$$