Question: Constraint Satisfaction Problem

You are in charge of scheduling for computer science classes that meet Mondays, Wednesdays and Fridays.
There are 5 classes that meet on these days and 3 professors who will be teaching these classes. You are
constrained by the fact that each professor can only teach one class at a time.
The classes are:

- Class 1 - Intro to Programming: meets from 8:00-9:00am
- Class 2 - Intro to Artificial Intelligence: meets from 8:30-9:30am
- Class 3 - Natural Language Processing: meets from 9:00-10:00am
- Class 4 - Computer Vision: meets from 9:00-10:00am
- Class 5 - Machine Learning: meets from 9:30-10:30am

The professors are:

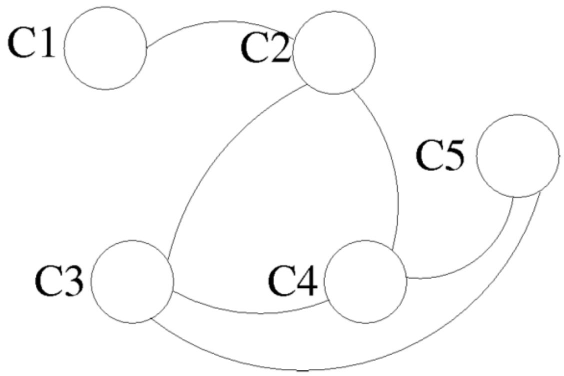
- Professor A, who is available to teach Classes 3 and 4.
- Professor B, who is available to teach Classes 2, 3, 4, and 5.
- Professor C, who is available to teach Classes 1, 2, 3, 4, 5.

a. Formulate this problem as a CSP problem in which there is one variable per class, stating the domains, and constraints. Constraints should be specified formally and precisely, but may be implicit rather
than explicit.

Variables	Domains
C1	{C}
C2	{B,C}
C3	{A,B,C}
C4	{A,B,C}
C5	{B,C}

Constraints:
$C1 \neq C2$
$C2 \neq C3$
$C3 \neq C4$
$C4 \neq C5$
$C2 \neq C4$
$C3 \neq C5$

b. Draw the constraint graph associated with your CSP.



c. Show the domains of the variables after running arc-consistency on this initial graph (after having
already enforced any unary constraints.

Variable	Domain
C1	{C}
C2	{B}
C3	{A,C}
C4	{A,C}
C5	{B,C}

Note that C5 cannot possibly be C, but arc consistency does not rule it out.

d. Give one solution to this CSP.

C1 = C, C2 = B, C3 = C, C4 = A, C5 = B.

One other solution is possible (where C3 and C4 are switched).

Question: Local Search- Simulated Annealing

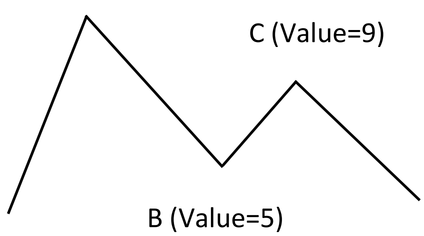
In the value landscape cartoon below, you will be asked about the probability that various moves will be accepted at different temperatures. Recall that Simulated Annealing always accepts a better move (ΔValue = Value[next] — Value[current] > 0.0); but it accepts a worse move (ΔValue < 0.0) only with probability e^(ΔValue/T), where T is the current temperature on the temperature schedule.

Please use this temperature schedule (usually, it is a decaying exponential; but it is simplified here):

Time (t)	1-200	201-300	301-400
Temperature (T)	15.0	5.0	0.1

You do not need a calculator; the values given have been chosen to follow this table:

x	0.0	-0.1	-0.4	-1.0	-4.0	-40.0
e^x	1.0	≈0.90	≈0.67	≈0.37	≈0.02	$\approx 4.0e\text{-}18$



Give your answer to two significant decimal places. **The first one is done for you as an example.**

(example) You are at Point A and t = 57. **The probability you will accept a move A -> B = 0.37**

a. You are at Point B and t = 213. **The probability you will accept a move B -> C = (1.0)**

b. You are at Point C and t = 343. **The probability you will accept a move C -> B = (4.0e-18)**