Q6: CSP Properties

Problem 6: CSP Properties

Part 1

1/1 point (ungraded)

After enforcing arc consistency in a CSP, if each variable's domain has at least one value remaining, then the remaining values in each variable's domain do not depend on the order in which arcs are processed from the queue.

- (•) True ✔
- ( ) False

Submit

✔ Correct (1/1 point)

Part 2

1/1 point (ungraded)

In a general CSP with n variables, each taking d possible values, what is the maximum number of times a backtracking search algorithm might have to backtrack (i.e. the number of the times it generates an assignment, partial or complete, that violates the constraints) before finding a solution or concluding that none exists?

- 0
- $O(1)$
- $O(nd^2)$
- $O(n^2d^3)$
- $O(d^n)$ ✔
- ∞

Submit

✔ Correct (1/1 point)

Part 3

1/1 point (ungraded)

What is the maximum number of times a backtracking search algorithm might have to backtrack (before finding a solution or concluding that none exists) in a general CSP, if it is running arc consistency and applying the MRV and LCV heuristics?

- 0
- $O(1)$
- $O(nd^2)$

- $O(n^2 d^3)$
- $O(d^n)$ ✔
- ∞

Submit

✔ Correct (1/1 point)

Part 4

1/1 point (ungraded)

What is the maximum number of times a backtracking search algorithm might have to backtrack (before finding a solution or concluding that none exists) in a *tree-structured* CSP, if it is running arc consistency and using an optimal variable ordering?

- 0 ✔
- $O(1)$
- $O(nd^2)$
- $O(n^2 d^3)$
- $O(d^n)$
- ∞

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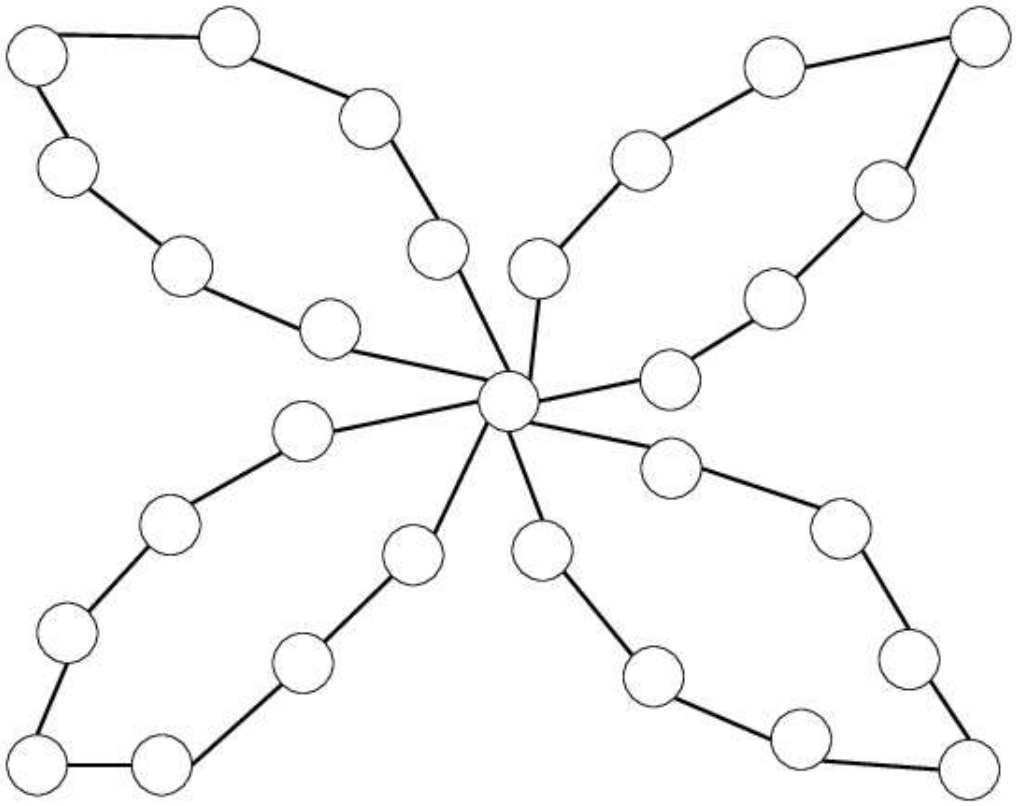
✔ Correct (1/1 point)

Part 5

Consider the following constraint graph:



Part 5.1

1/1 point (ungraded)

What's the size of the smallest cutset for the above graph? Measure the size of the cutset by the number of variables.

◉ 1 ✔

- 4
- 7
- 8
- 9

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✔ Correct (1/1 point)

Part 5.2

2/2 points (ungraded)

We again consider the above graph. Notice that it has 4 loops of 7 nodes each.

Let's consider a more general version of this graph where we still have 4 loops, but each loop now has n nodes. How does the runtime of solving this more general CSP scale with n, assuming we use cutset conditioning?

- $O(n)$ ✔
- $O(n^2)$
- $O(n^3)$
- $O(2^n)$
- $O(n!)$

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✔ Correct (2/2 points)