

## Constraint Programming and Scheduling: Sample Examination

1. How would you define arc consistency for binary constraints?
2. What domain variables are necessary to describe scheduling problem as a constraint satisfaction problem?

Solution:

- StartA ... domain variable for start time of each activity A
  - EndA ... domain variable for completion time of each activity A
  - PA ... domain variable for processing time of each activity A
  - CapA ... requested capacity of each activity A
  - ResourceA ... alternative resources for each activity A
3. Write solution space for constraints A in 1..4, B in 3..4, C in 3..4,  $B \#< C$ ,  $A \# = C$  when using forward checking and ordering of variables A,B,C. Explain what types of propagation happens at each node.
  4. Company should produce N products and it can produce at most M products at any time. Processing time of each product I is PI and each product must be completed before its deadline DI. When particular products should be produced?

Define domain variables with their domains and write constraint(s) to describe the model of this constraint satisfaction problem.

Solution:

- domain variable for starting time of each product I: StartI in  $0..(Di-Pi)$
- domain variable for completion time of each product I: EndI  $\# =$  StartI + PI
- constraint:  
cumulative([task(Start1,End1,P1,1,1), ..., task(StartN,EndN,PN,1,N)], [limit(M) | Options])