

## Assembly Line Balancing Problem

Workspace used: **ALB** (Macintosh)

Load the **ALB** workspace and randomly generate a problem with 20 tasks. Seed=\_\_\_\_\_

- a. Determine the cycle time required for a production rate of 3 per hour, and revise the problem data to this value.
- b. Sketch a precedence diagram for the tasks (i.e. with a node for each task, and an arrow from each immediate predecessor).

- c. Solve the problem using each of the four heuristic algorithms in the **ALB** workspace:
  - (i) Kilbridge/Wester,
  - (ii) Ranked Positional Weight Method,
  - (iii) Reverse Rank Positional Weight Method, and
  - (iv) COMSOAL (specify 20 trial solutions).

Method	# of stations	Idle Time at Stations	
		Maximum	Minimum
K&W	_____	_____	_____
RPWM	_____	_____	_____
R-RPWM	_____	_____	_____
COMSOAL	_____	_____	_____

- d. For each method, explain the computations involved in assigning tasks for the **second** station.
- e. Is any method able to find a *perfect* balance in (c)?
- f. Are the four solutions found in (c) all different? Do all use the same number of stations? If not, which of the four solutions do you think might be preferable in practice?
- g. What cycle time is required for a perfect balance of 4 stations?  $C =$  \_\_\_\_\_
- h. Solve the problem again, using each of the four methods after revising the cycle time to that specified in (d). Is any method able to find a perfect balance?

Next, solve the problem using the *genetic algorithm* (GA). Note that the GA solves a slightly different problem, namely: *Given a specified number of stations, what is the minimum achievable cycle time?*

- i. First, use the default values for the GA parameters, and run the algorithm for 50 generations. What is the best cycle time which is found?

Method	Cycle time	Idle Time at Stations	
		Maximum	Minimum
GA	_____	_____	_____

- j. Next, modify the crossover probability and the number of generations, and rerun the GA. Compare your result with that in (i).

$P_{\text{cross}} = \text{_____} \%$   
 Max # of generations = \_\_\_\_\_

Method	Cycle time	Idle Time at Stations	
		Maximum	Minimum
GA	_____	_____	_____