

Department of Industrial Engineering University of Stellenbosch

Simulasie 442 : Simulation 442 2025

Tutoriaal 9 <i>Tutorial 9</i>	Punt: 112 <i>Mark:</i>	Ingeedatum: 03-10-2025 (10:00) B3003 <i>Due date:</i>
Instruksies: <i>Instructions:</i>	Formateer alle syfers sinvol. Ontwikkel die modelle individueel. U mag in groepe van twee of minder werk om die vrae te beantwoord. Handig slegs een dokument in. Gebruik Tecnomatix en Excel vir u berekenings. <i>Format all numbers sensibly.</i> <i>Develop the models individually.</i> <i>You may work in groups of two or less when answering the questions.</i> <i>Submit one document only.</i> <i>Use Tecnomatix and Excel for your calculations.</i>	

Question 1: The inventory model [20]

Complete the table below to show your understanding of the Inventory Model built this week.

State the:	Inventory Model	
Essence of the problem		[2]
Objective of the simulation		[1]
Input variables		[3]
Decision variables		[2]
Output parameters		[2]
Assumptions made		[2]
Validation considerations		[2]
/////		
<i>Apply Shannon's world view:</i>		
Entity		[1]
Attributes		[1]
Resources		[1]
Conditions		[1]
Events		[1]
System State		[1]

Question 2: The inventory model [50]

Build the inventory model in Tecnomatix and answer the following questions:

1. Formulate the multi-objective simulation optimisation problem, like (6.13) on p. 96 of the eBook.

[5]

2. Give numerical values for r and Q with graphical evidence of how you verified/validated your model.

[8]

3. Using the **ExperimentManager**, determine the near-optimal (r, Q) combination which will ensure lowest possible inventory cost and highest possible service level.

[10]

4. Plot some scenario outcomes as coordinates (f_1, f_2) , where f_1 = Average inventory cost, and f_2 = service level.

[5]

5. How is the service level calculated?

[2]

6. Use the GA Wizard of TPS and find good values for r and Q so that the service level is maximised. State your parameter values.

[10]

7. Use the DBMOSA Wizard provided in the model file **rQwithDBMOSA.spp** and find good values for r and Q so that the inventory cost is minimised and the service level is maximised. State your parameter values.

[10]

Question 3: The Sawmill model [20]

Complete the table below to show your understanding of the Sawmill Model built this week.

State the:	Sawmill Model	
Essence of the problem		[2]
Objective of the simulation		[1]
Input variables		[3]
Decision variables		[4]
Output parameters		[2]
Assumptions made		[2]
Validation considerations		[2]
/////		
<i>Shannon's world view:</i>		
Entity		[1]
Attributes		[1]
Resources		[1]
Conditions		[1]
Events		[1]
System State		[1]

Question 4: The Sawmill model [22]

Run the experiments as given by the *ExperimentManager*. There should be 72 Experiments. *Please change the model run-time to 8 hours.*

1. Find the best combination for the peel rate, bin size, and the two conveyor speeds to maximise throughput.

[8]

2. Find a good combination of the peel rate, bin size, and the two conveyor speeds to maximise throughput while simultaneously minimising the cost. (For this question you may need to use the Excel workbook `FilterParetoFront_Extended.xlsm`).

[10]

3. Given that the sawmill sells the veneers for $R50/m^3$, determine the best combination of peel rate, bin size, and the two conveyor speeds by reformulating the problem as a single-objective optimisation problem.

[4]