TORA SOFTWARE REPORT

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TORA

TORA (Tools for Operations Research and Analysis) software is a popular software package used in Operations Research and Decision Analysis. It contains a wide variety of algorithms and programs that help solve various operational models. In this report, we will discuss the different programs and algorithms that TORA software contains, along with the operational steps involved in the solution of various operational models.

1)Linear Programming (LP):

Linear Programming is a mathematical optimization technique used to find the best possible solution to a problem with linear constraints. TORA software has an LP module that contains programs and algorithms to solve LP problems. The operational steps involved in solving LP problems using TORA software are as follows:

1)Formulate the LP problem in the form of an objective function and constraints.

2)Enter the LP problem into TORA software using the LP module.

3)Solve the LP problem using the Simplex algorithm, which is one of the algorithms contained in the LP module.

4)Interpret the results obtained from the LP problem.

2)Network Analysis:

Network Analysis is a mathematical technique used to study the flow of resources or information through a network. TORA software has a Network Analysis module that contains programs and algorithms to solve network problems. The operational steps involved in solving network problems using TORA software are as follows:

1)Draw the network diagram.

2)Define the activities and their durations.

3)Define the dependencies between the activities.

4)Enter the network problem into TORA software using the Network Analysis module.

5)Solve the network problem using the CPM algorithm, which is one of the algorithms contained in the Network Analysis module.

6)Interpret the results obtained from the network problem.

3)Integer Programming (IP):

Integer Programming is a mathematical optimization technique used to find the best possible solution to a problem with integer constraints. TORA software has an IP module that contains programs and algorithms to solve IP problems. The operational steps involved in solving IP problems using TORA software are as follows:

1)Formulate the IP problem in the form of an objective function and constraints.

2)Enter the IP problem into TORA software using the IP module.

3)Solve the IP problem using the Branch and Bound algorithm, which is one of the algorithms contained in the IP module.

4)Interpret the results obtained from the IP problem.

4)Decision Analysis:

Decision Analysis is a mathematical technique used to evaluate different alternatives and make the best possible decision. TORA software has a Decision Analysis module that contains programs and algorithms to solve decision problems. The operational steps involved in solving decision problems using TORA software are as follows:

1)Define the decision problem.

2)Identify the alternatives and their consequences.

3)Assign probabilities to the different outcomes.

4)Enter the decision problem into TORA software using the Decision Analysis module.

5)Solve the decision problem using the Expected Value algorithm, which is one of the algorithms contained in the Decision Analysis module.

6)Interpret the results obtained from the decision problem.

5)Queuing Theory:

Queuing Theory is a mathematical technique used to study the flow of customers through a system. TORA software has a Queuing Theory module that contains programs and algorithms to solve queuing problems. The operational steps involved in solving queuing problems using TORA software are as follows:

1)Define the queuing problem.

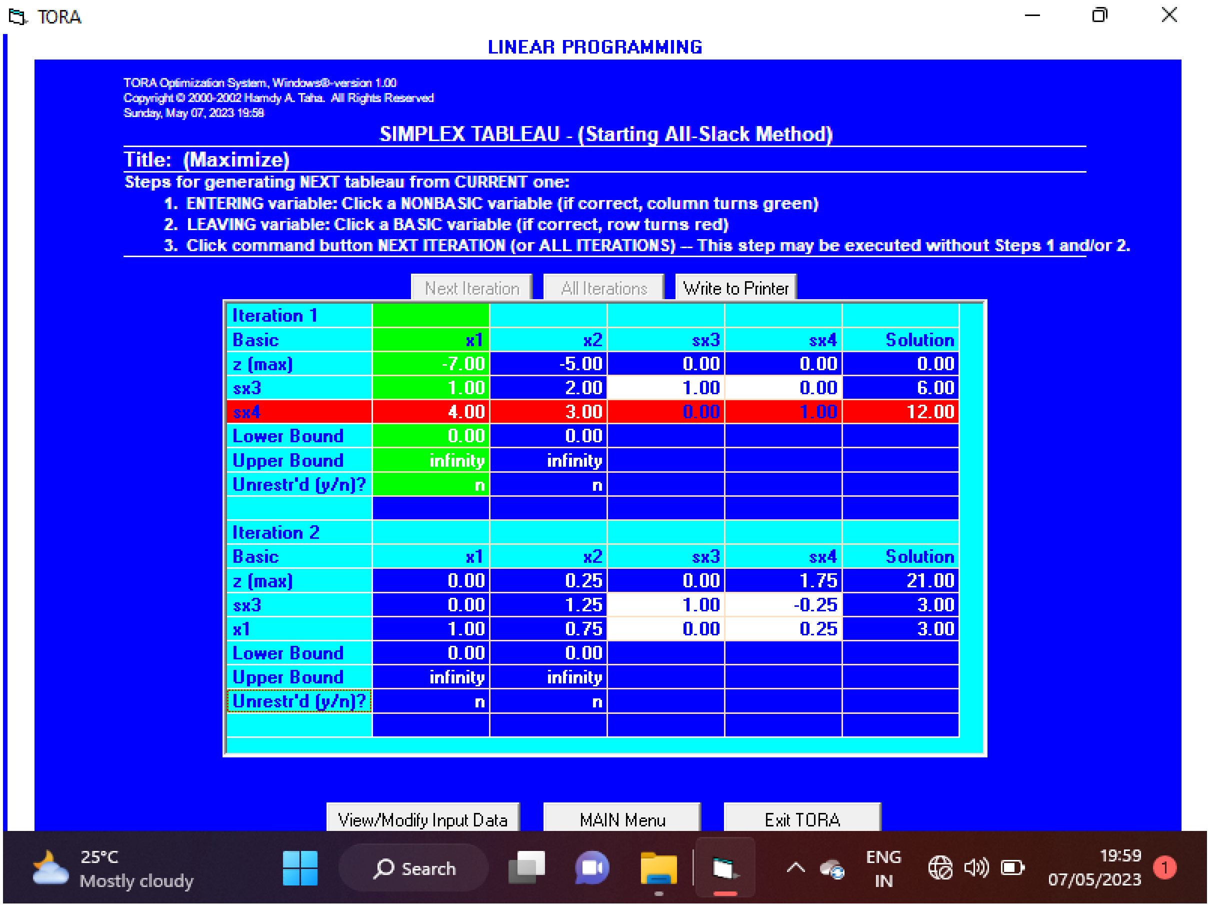
2)Define the arrival rate and service rate.

3)Enter the queuing problem into TORA software using the Queuing Theory module.

4)Solve the queuing problem using the M/M/1 algorithm, which is one of the algorithms contained in the Queuing Theory module.

5)Interpret the results obtained from the queuing problem.

LPP PROBLEM SOLVED BY USING SIMPLEX PROBLEM



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LINEAR PROGRAMMING

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SIMPLEX TABLEAU - (Starting All-Slack Method)

Title: (Maximize)

Steps for generating NEXT tableau from CURRENT one:

1. ENTERING variable: Click a NONBASIC variable (if correct, column turns green)
2. LEAVING variable: Click a BASIC variable (if correct, row turns red)
3. Click command button NEXT ITERATION (or ALL ITERATIONS) -- This step may be executed without Steps 1 and/or 2.

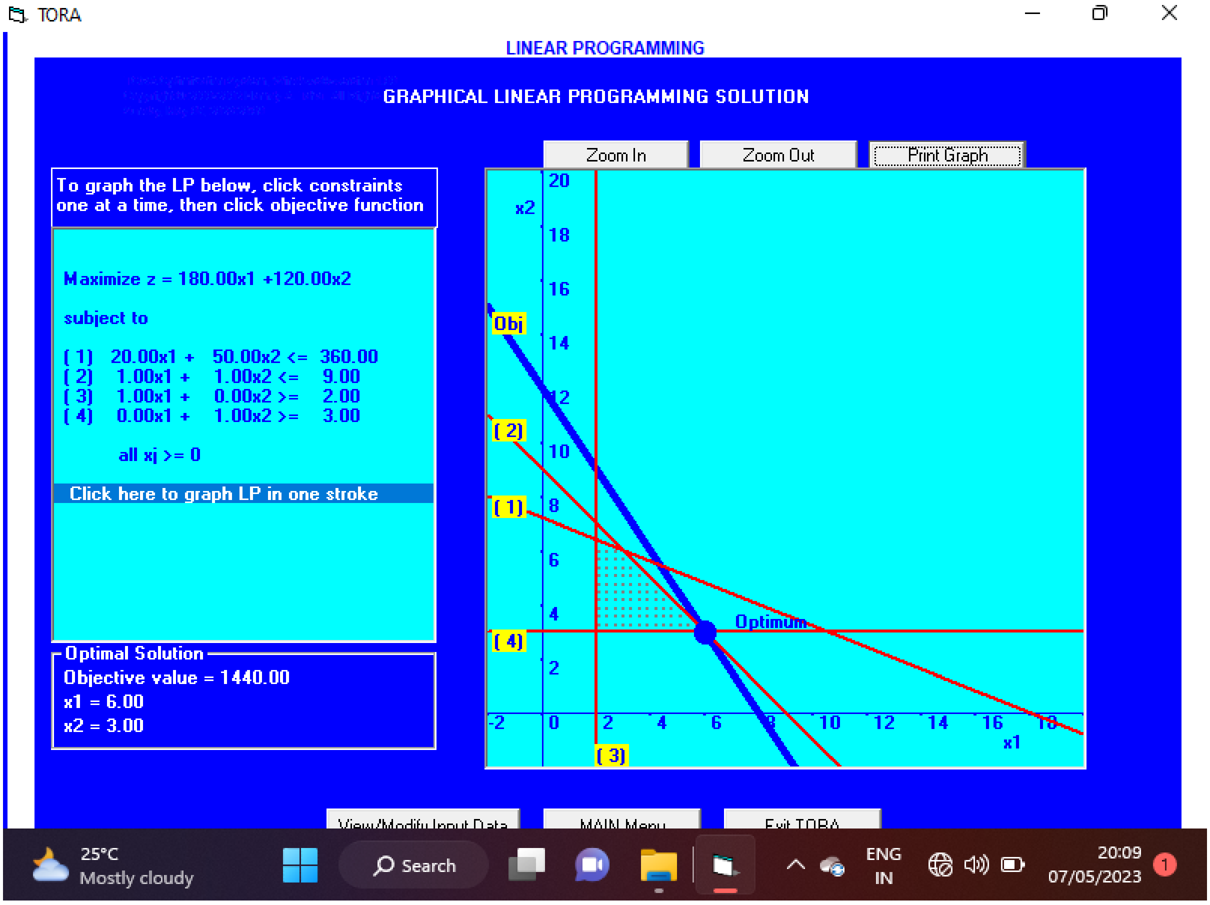
Next Iteration | All Iterations | Write to Printer

Iteration 1					
Basic	x1	x2	sx3	sx4	Solution
z (max)	-7.00	-5.00	0.00	0.00	0.00
sx3	1.00	2.00	1.00	0.00	6.00
sx4	4.00	3.00	0.00	1.00	12.00
Lower Bound	0.00	0.00			
Upper Bound	infinity	infinity			
Unrestr'd (y/n)?	n	n			

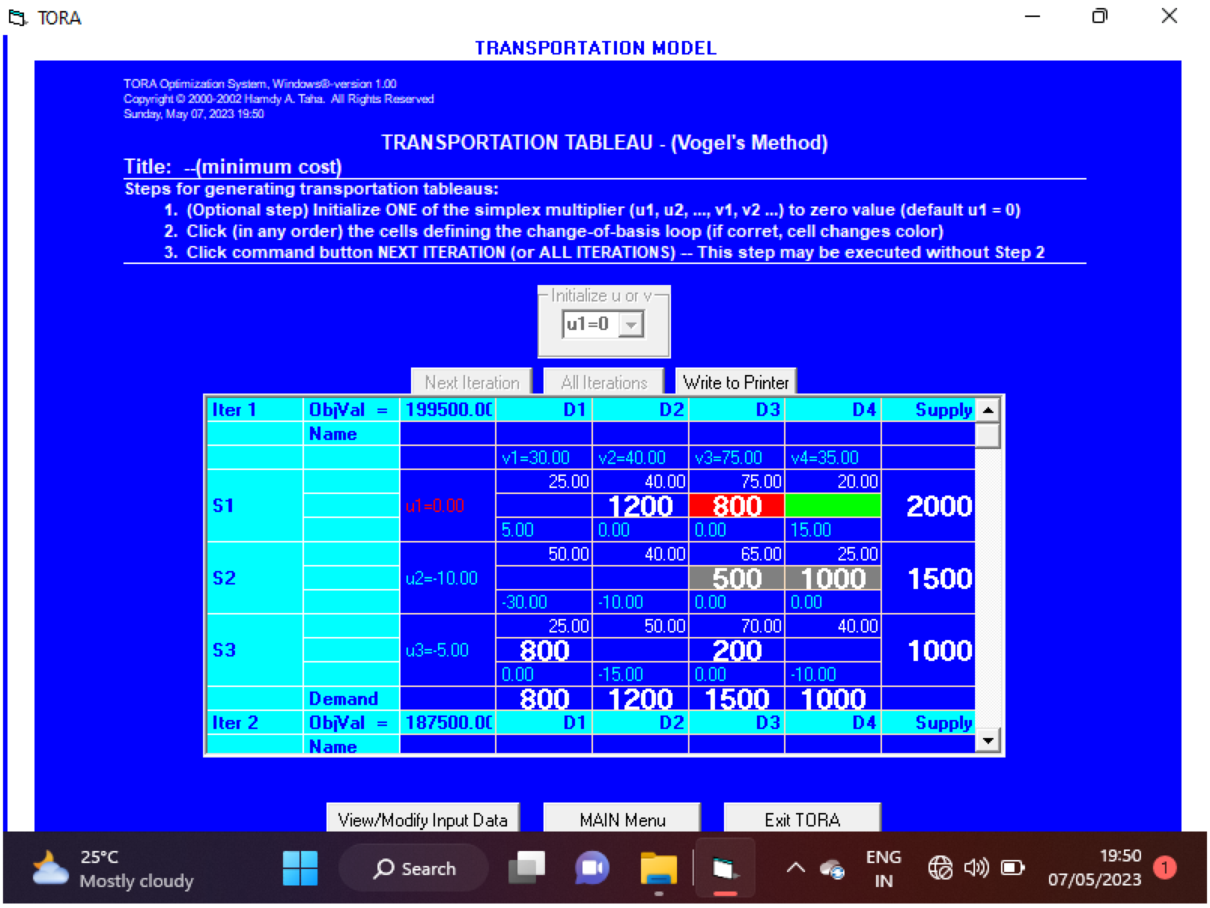
Iteration 2					
Basic	x1	x2	sx3	sx4	Solution
z (max)	0.00	0.25	0.00	1.75	21.00
sx3	0.00	1.25	1.00	-0.25	3.00
x1	1.00	0.75	0.00	0.25	3.00
Lower Bound	0.00	0.00			
Upper Bound	infinity	infinity			
Unrestr'd (y/n)?	n	n			

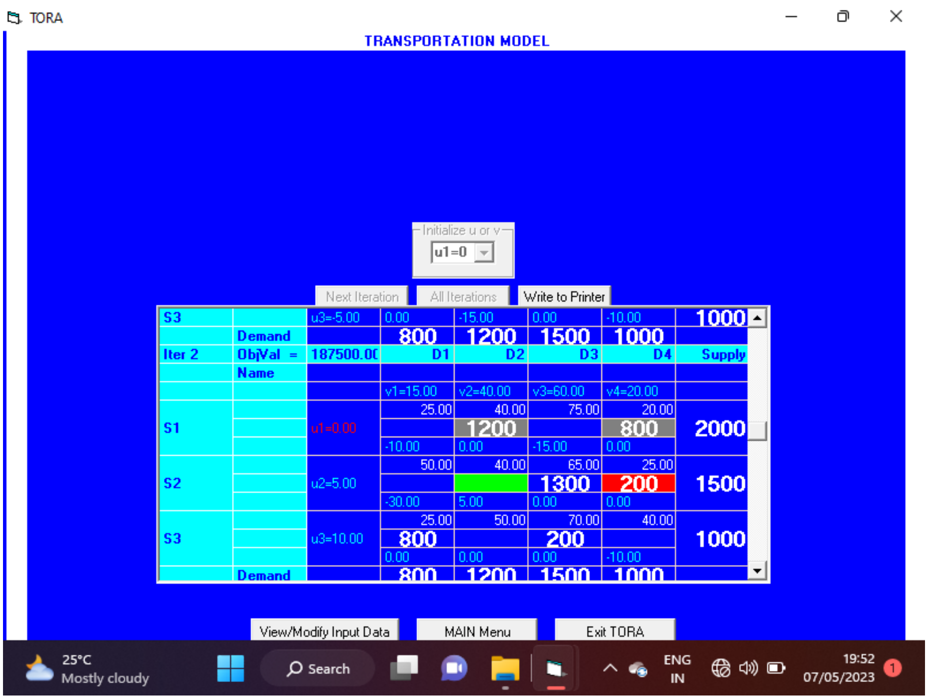
View/Modify Input Data | MAIN Menu | Exit TORA

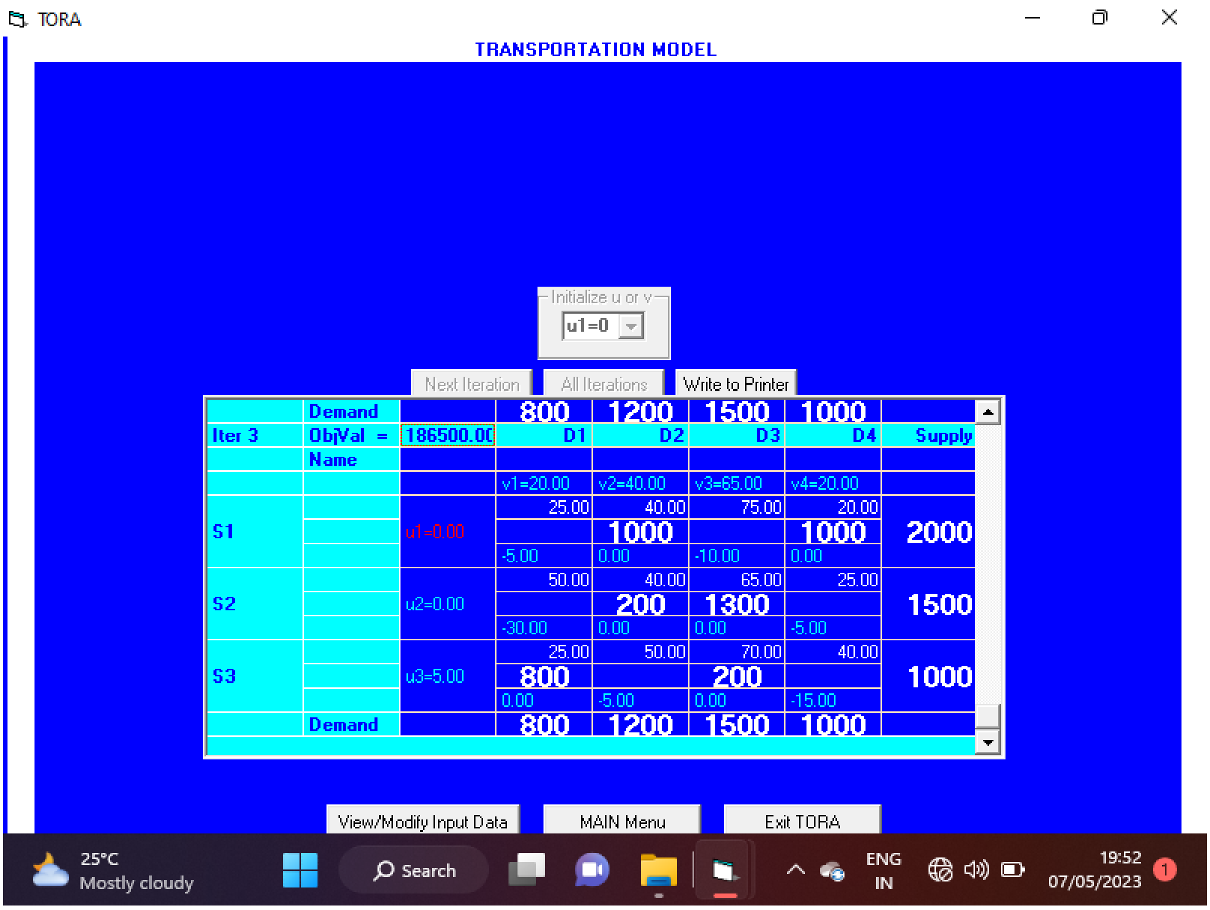
LPP PROBLEM SOLVED BY USING GRAPHICAL PROBLEM



TRANSPORTATION PROBLEM

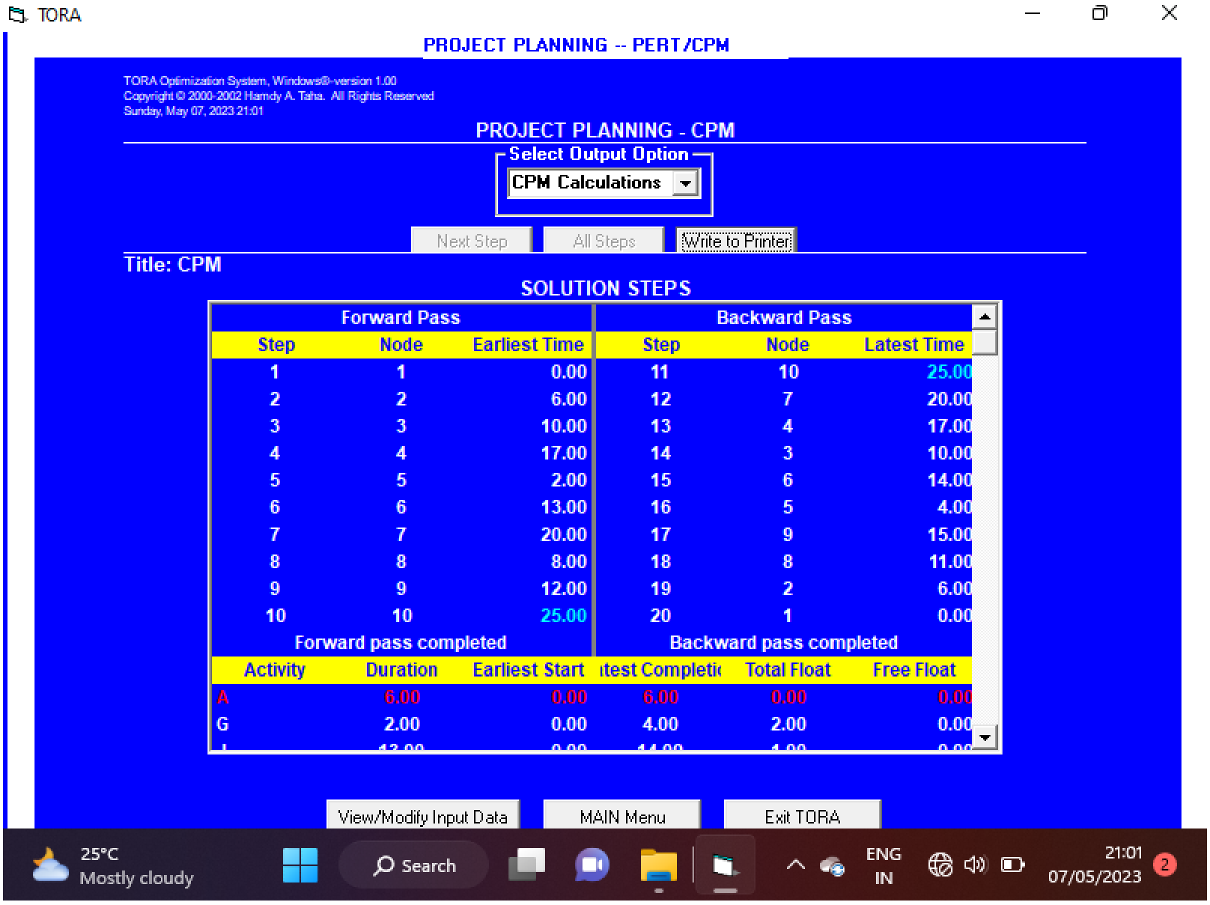






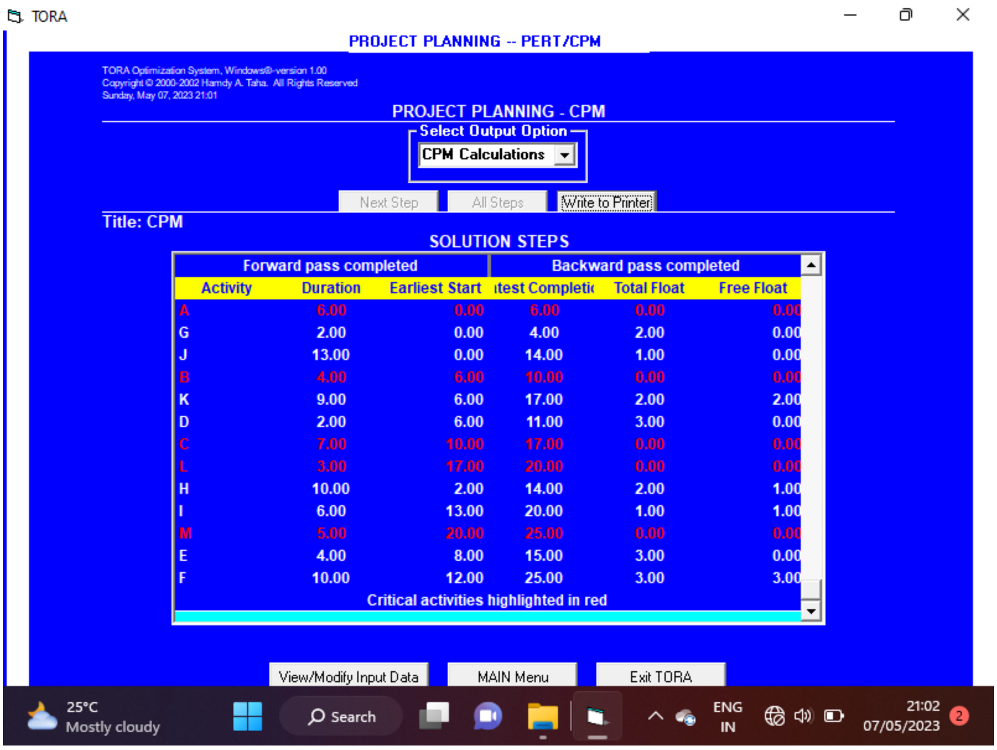
	Demand		800	1200	1500	1000	
Iter 3	ObjVal =	186500.00	D1	D2	D3	D4	Supply
	Name						
			v1=20.00	v2=40.00	v3=65.00	v4=20.00	
S1		u1=0.00	25.00	40.00 1000 0.00	75.00	20.00 1000 0.00	2000
			-5.00		-10.00		
S2		u2=0.00	50.00	40.00 200 0.00	65.00 1300 0.00	25.00	1500
			-30.00			-5.00	
S3		u3=5.00	25.00 800 0.00	50.00	70.00 200 0.00	40.00	1000
				-5.00		-15.00	
	Demand		800	1200	1500	1000	

CRITICAL PATH METHOD PROBLEM



Forward Pass			Backward Pass		
Step	Node	Earliest Time	Step	Node	Latest Time
1	1	0.00	11	10	25.00
2	2	6.00	12	7	20.00
3	3	10.00	13	4	17.00
4	4	17.00	14	3	10.00
5	5	2.00	15	6	14.00
6	6	13.00	16	5	4.00
7	7	20.00	17	9	15.00
8	8	8.00	18	8	11.00
9	9	12.00	19	2	6.00
10	10	25.00	20	1	0.00
Forward pass completed			Backward pass completed		

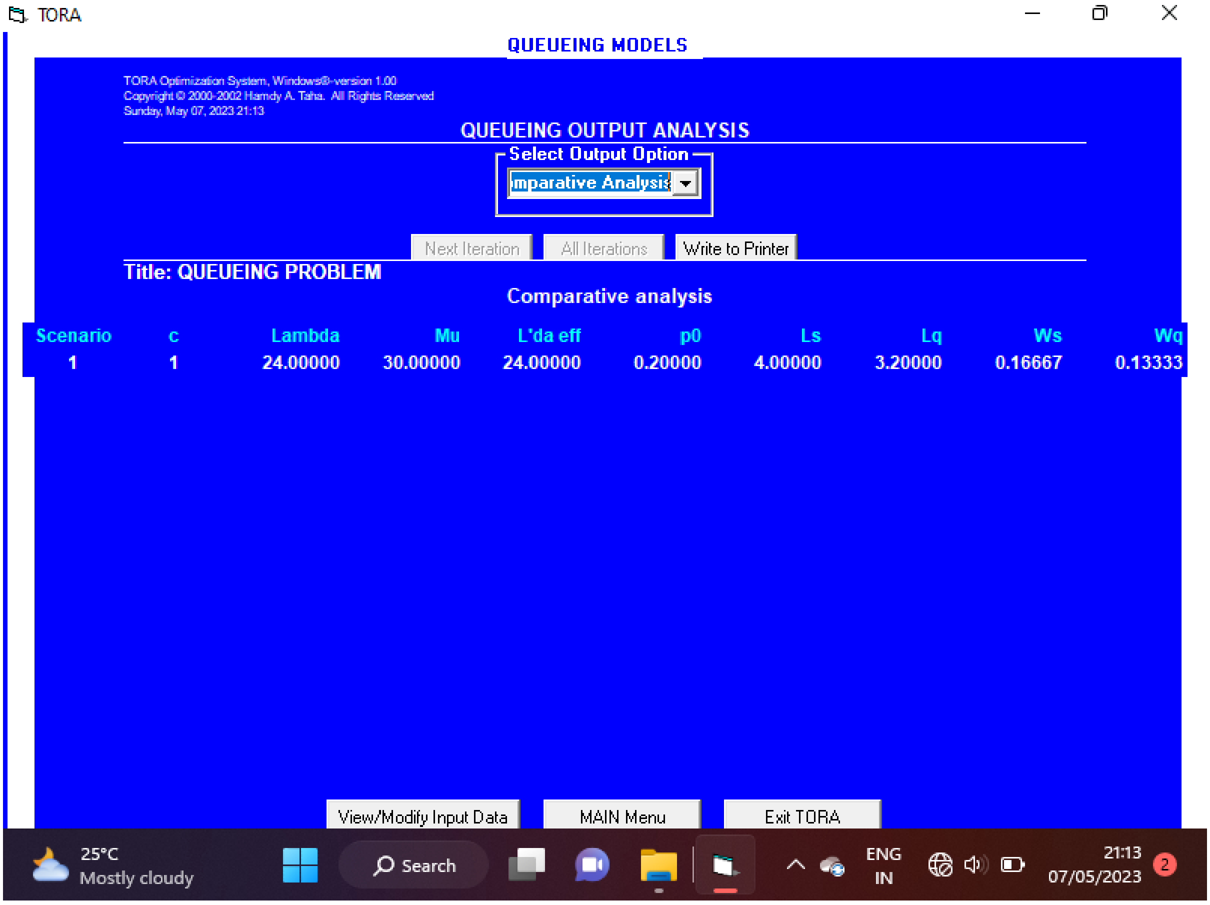
Activity	Duration	Earliest Start	ıtest Completi	Total Float	Free Float
A	6.00	0.00	6.00	0.00	0.00
G	2.00	0.00	4.00	2.00	0.00



Forward pass completed			Backward pass completed		
Activity	Duration	Earliest Start	ıtest Completi	Total Float	Free Float
A	6.00	0.00	6.00	0.00	0.00
G	2.00	0.00	4.00	2.00	0.00
J	13.00	0.00	14.00	1.00	0.00
B	4.00	6.00	10.00	0.00	0.00
K	9.00	6.00	17.00	2.00	2.00
D	2.00	6.00	11.00	3.00	0.00
C	7.00	10.00	17.00	0.00	0.00
L	3.00	17.00	20.00	0.00	0.00
H	10.00	2.00	14.00	2.00	1.00
I	6.00	13.00	20.00	1.00	1.00
M	5.00	20.00	25.00	0.00	0.00
E	4.00	8.00	15.00	3.00	0.00
F	10.00	12.00	25.00	3.00	3.00

Critical activities highlighted in red

QUEUEING PROBLEM



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QUEUEING MODELS

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QUEUEING OUTPUT ANALYSIS

Select Output Option

mparative Analysis

Next Iteration | All Iterations | Write to Printer

Title: QUEUEING PROBLEM

Comparative analysis

Scenario	c	Lambda	Mu	L'da eff	p0	Ls	Lq	Ws	Wq
1	1	24.00000	30.00000	24.00000	0.20000	4.00000	3.20000	0.16667	0.13333

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QUEUEING MODELS

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QUEUEING OUTPUT ANALYSIS

Select Output Option

Scenario1

Next Iteration | All Iterations | Write to Printer

Title: QUEUEING PROBLEM

Scenario 1:(M/M/1):(GD/infinity/infinity)

Lambda =	24.00000	Mu =	30.00000
L'da eff =	24.00000	Rho/c =	0.80000
Ls =	4.00000	Lq =	3.20000
Ws =	0.16667	Wq =	0.13333

n	Probability, pn	Cumulative, Pn	n	Probability, pn	Cumulative, Pn
0	0.20000	0.20000	23	0.00118	0.99528
1	0.16000	0.36000	24	0.00094	0.99622
2	0.12800	0.48800	25	0.00076	0.99698
3	0.10240	0.59040	26	0.00060	0.99758
4	0.08192	0.67232	27	0.00048	0.99807
5	0.06554	0.73786	28	0.00039	0.99845
6	0.05243	0.79028	29	0.00031	0.99876
7	0.04194	0.83223	30	0.00025	0.99901
8	0.03355	0.86578	31	0.00020	0.99921
9	0.02684	0.89263	32	0.00016	0.99937

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QUEUEING MODELS

QUEUEING OUTPUT ANALYSIS

Select Output Option: Scenario1

Next Iteration | All Iterations | Write to Printer

Title: QUEUEING PROBLEM

Scenario 1:(M/M/1):(GD/infinity/infinity)

Lambda =	24.00000	Mu =	30.00000
L'da eff =	24.00000	Rho/c =	0.80000
Ls =	4.00000	Lq =	3.20000
Ws =	0.16667	Wq =	0.13333

9	0.02684	0.89263	32	0.00016	0.99937
10	0.02147	0.91410	33	0.00013	0.99949
11	0.01718	0.93128	34	0.00010	0.99959
12	0.01374	0.94502	35	0.00008	0.99968
13	0.01100	0.95602	36	0.00006	0.99974
14	0.00880	0.96482	37	0.00005	0.99979
15	0.00704	0.97185	38	0.00004	0.99983
16	0.00563	0.97748	39	0.00003	0.99987
17	0.00450	0.98199	40	0.00003	0.99989
18	0.00360	0.98559	41	0.00002	0.99991
19	0.00288	0.98847	42	0.00002	0.99993

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QUEUEING MODELS

QUEUEING OUTPUT ANALYSIS

Select Output Option: Scenario1

Next Iteration | All Iterations | Write to Printer

Title: QUEUEING PROBLEM

Scenario 1:(M/M/1):(GD/infinity/infinity)

Lambda =	24.00000	Mu =	30.00000
L'da eff =	24.00000	Rho/c =	0.80000
Ls =	4.00000	Lq =	3.20000
Ws =	0.16667	Wq =	0.13333

13	0.01100	0.95602	36	0.00006	0.99974
14	0.00880	0.96482	37	0.00005	0.99979
15	0.00704	0.97185	38	0.00004	0.99983
16	0.00563	0.97748	39	0.00003	0.99987
17	0.00450	0.98199	40	0.00003	0.99989
18	0.00360	0.98559	41	0.00002	0.99991
19	0.00288	0.98847	42	0.00002	0.99993
20	0.00231	0.99078	43	0.00001	0.99995
21	0.00184	0.99262	44	0.00001	0.99996
22	0.00148	0.99410			

View/Modify Input Data | MAIN Menu | Exit TORA

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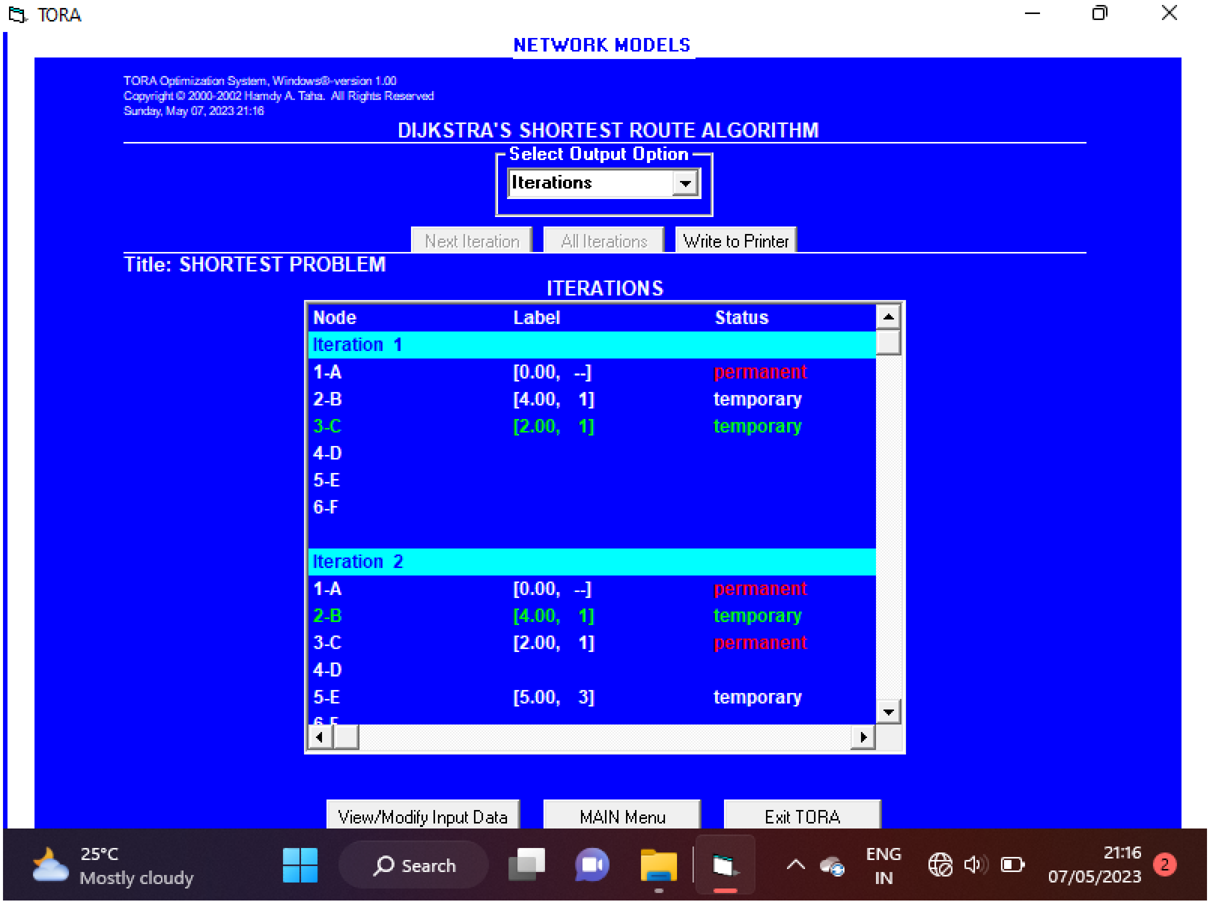
SHORTEST ROUTE PROBLEM BY USING DIJKSHTRA ALGORITHM



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DIJKSTRA'S SHORTEST ROUTE ALGORITHM
Select Output Option
Iterations
Next Iteration
All Iterations
Write to Printer
Title: SHORTEST PROBLEM
ITERATIONS
Iteration 3
1-A [0.00, --] permanent
2-B [4.00, 1] permanent
3-C [2.00, 1] permanent
4-D [14.00, 2] temporary
5-E [5.00, 3] temporary
6-F
Iteration 4
1-A [0.00, --] permanent
2-B [4.00, 1] permanent
3-C [2.00, 1] permanent
4-D [9.00, 5] temporary
5-E [5.00, 3] permanent
6-F
View/Modify Input Data
MAIN Menu
Exit TORA
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DIJKSTRA'S SHORTEST ROUTE ALGORITHM
Select Output Option
Iterations
Next Iteration
All Iterations
Write to Printer
Title: SHORTEST PROBLEM
ITERATIONS
Iteration 5
1-A [0.00, --] permanent
2-B [4.00, 1] permanent
3-C [2.00, 1] permanent
4-D [9.00, 5] permanent
5-E [5.00, 3] permanent
6-F [20.00, 4] temporary
Iteration 6
1-A [0.00, --] permanent
2-B [4.00, 1] permanent
3-C [2.00, 1] permanent
4-D [9.00, 5] permanent
5-E [5.00, 3] permanent
6-F [20.00, 4] permanent
View/Modify Input Data
MAIN Menu
Exit TORA
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Search
ENG
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21:17
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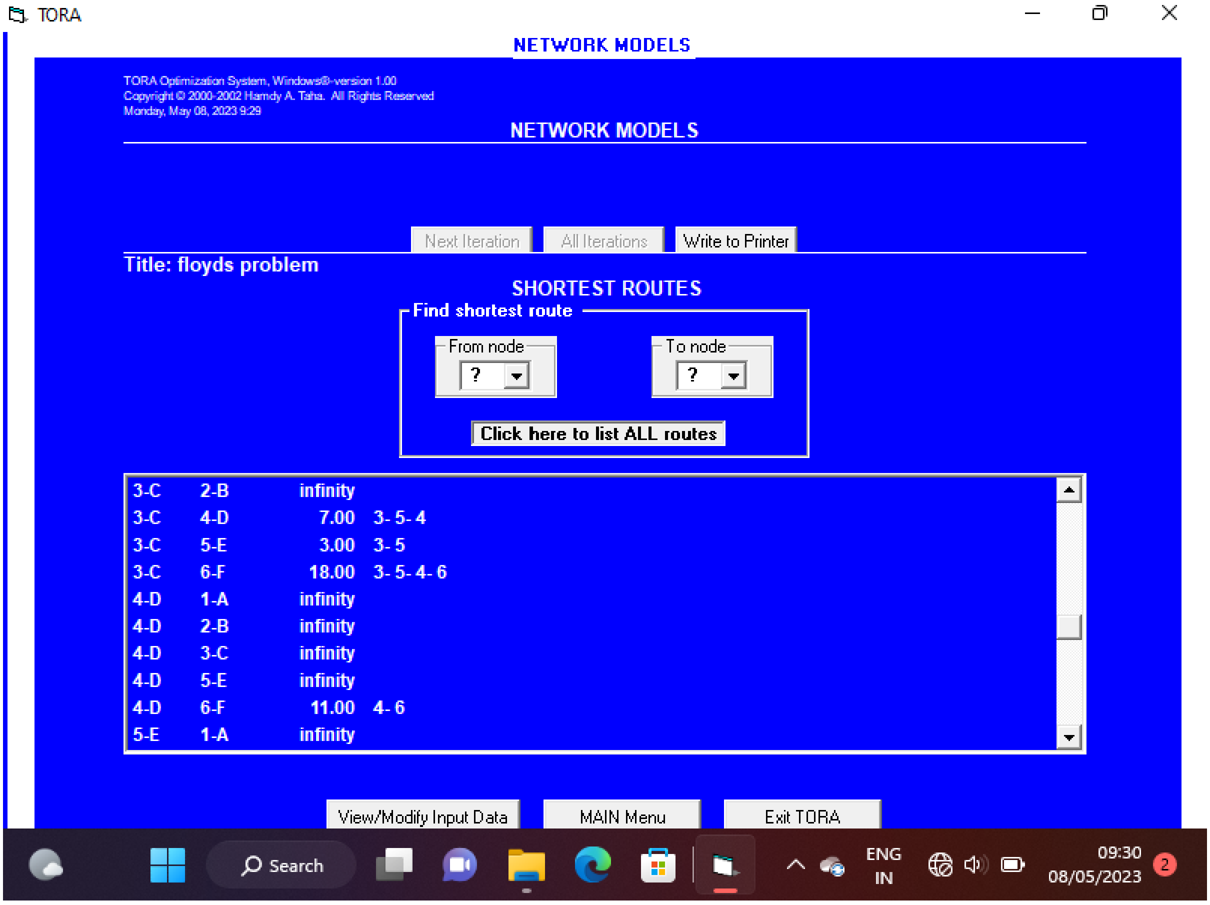
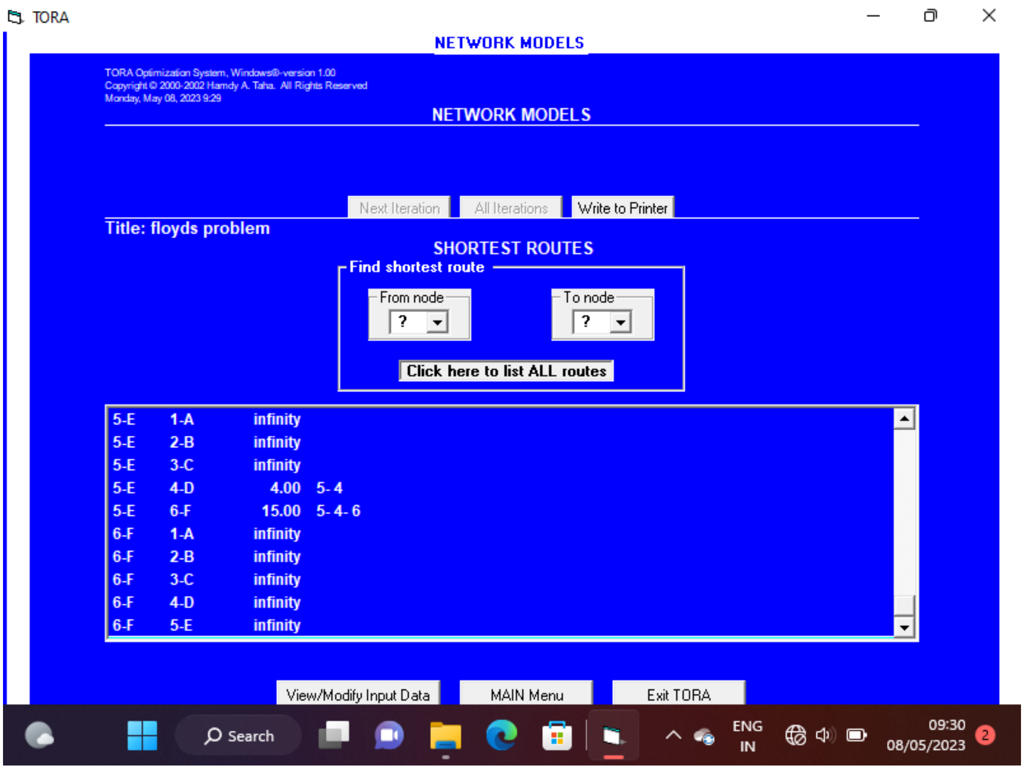
SHORTEST ROUTE PRBLEM BY USING FLOYDS ALGORITHM





CONCLUSION

In conclusion, TORA software is a powerful tool for solving a wide variety of operational models in Operations Research and Decision Analysis. The software contains programs and algorithms for Linear Programming, Network Analysis, Integer Programming, Decision Analysis, and Queuing Theory. The operational steps involved in solving these problems.