



**K. K. Wagh Institute of Engineering Education & Research, Nashik**  
(An Autonomous Institute From A.Y. 2022-23)

WINTER-2024	
Exam Seat No.:	
Academic Year:2024-2025	Semester:I
Class: FYMBA	Program:MBA
Branch Code:M.B.A.	Pattern:2024
Name of Course:Decision Science	Course Code:2410506
Max. Marks:60	Duration:2.30 Hrs.

**Instructions:** Candidates should read carefully the instructions printed on the Question Paper and on the cover page of the Answer Book, which is provided for their use.

1. This question paper contains 5 pages.
2. Answer to each new question is to be started on a new page.
3. Assume suitable data wherever required, but justify it.
4. Draw the neat labelled diagrams, wherever necessary.
5. The last columns indicates the Course Outcome and level of Blooms Taxonomy of the Question/sub-question.
6. Q1. and Q2. are compulsory. Solve (a) or (b) and (c) or (d) for Q. No. 3, 4 and 5.
7. Use of normal calculator is allowed. Scientific calculator is not allowed.

**Marks CO**

**Question No. 1**

- 1a) a. Discuss the different methods for solving models. (6) CO1
- b. Write about the formulation of Linear programming.

**Question No. 2**

- 2a) A milk parlour keeps a stock of curd previous experience indicates the daily sales as given below: (6) CO2

Daily sales	0	10	20	30	40	50
Probability	0.01	0.20	0.15	0.50	0.12	0.02

Consider the following random number to simulate: Random numbers: 48, 78, 19, 51, 56, 77, 15, 14, 68, 09 Using above data simulate the sales for next 10 days Find daily balance if the owner of the milk parlor keeps 30 kgs of card every day and also find the average sales.

**Question No. 3**

- 3a) i) Explain the concept of Queuing theory through system and terminologies. (8) CO3
- ii) In a railway marshalling yard, goods train arrive at a rate of 30 trains per da. Assuming that the interval time follows an exponential distribution and the service time distribution is also exponential with an average of 36 minutes. Calculate:
- a. Expected queue size (Line length).
- b. Calculate the waiting time for the customer in queue.

OR

- 3b) A manufacturer has distribution centres at Agra, Allahabad and Kolkata. These centres have availability of 40,20 and 40 units of his product respectively. His retail outlets at A, B, C, D and E require 25,10,20,30 and 15 units of the products respectively. The transport cost (in rupees) per unit between each centre outlet as given below: (8) CO3

Distribution Centre	Retail Outlets				
	A	B	C	D	E
Agra	55	30	40	50	40
Allahabad	35	30	100	45	60
Kolkata	40	60	95	35	30

Determine the initial feasible solution through (Including transportation formulation)

- North-West Corner Method
- Least Cost Method

- 3c) Solve the below transportation problem through three steps to find the optimal solution: (8) CO3

	A	B	C	D	Supply
P	19	30	50	10	7
Q	70	30	40	60	9
R	40	8	70	20	18
Demand	5	8	7	14	34

OR

- 3d) A whole selling company has three warehouses from which the supplies are drawn for four retail customers. The company deals in a single product, the supply of which at each warehouse are: (8) CO3

	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	Supply
W <sub>1</sub>	3	6	8	5	20
W <sub>2</sub>	6	1	2	5	28
W <sub>3</sub>	7	8	3	9	17
Demand	15	19	13	18	

Determine what supplies should be dispatched from each of the warehouses to each customer so as to minimize the overall transportation cost.

**Question No. 4**

4a) The three estimates of time in weeks for activities of a project are given below:

(8) CO4

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
<b>Pessimistic Time</b>	7	7	12	15	1	8	7
<b>Most Likely Time</b>	6	1	4	6	1	2	4
<b>Optimistic Time</b>	5	1	2	3	1	2	1

Draw network diagram. Find out Critical path & Project duration. Estimate expected Standard deviation of critical path.

**OR**

4b) A Company manufacturing plant and equipment for chemical processing is in the process of quoting a tender called by a public sector undertaking. The delivery data, once promised is crucial and a penalty clause is applicable. The project manager has listed down the activities in the project as under:

(8) CO4

Activity	Immediate Predecessor	Activity Time (In Weeks)		
		Optimistic Time	Most Likely Time	Pessimistic Time
A	-	1	3	5
B	-	2	4	6
C	A	3	5	7
D	A	5	6	7
E	C	5	7	9
F	D	6	8	10
G	B	7	9	11
H	E,F,G	2	3	4

a) Find out the delivery week from the date of commencement of the project.

Find the total float and free float for each of Non- Critical Activities.

4c) The following are the time estimates and the precedence relationships of the activities in a project network.

(8) CO4

Activities	A	B	C	D	E	F	G	H	I	J	K
Immediate Predecessors	-	-	-	A	B	B	C	E	D	F,G	H,I
Duration in Weeks	4	7	3	6	4	7	6	10	3	4	2

Draw the project network diagram. Calculate Slack. Determine the critical path and the project completion time.

**OR**

- 4d) The activities of a project are tabulated below with immediate predecessors and normal and crash time cost. (8) CO4

Activity	Immediate Predecessor	Normal		Crash	
		Cost (Rs.)	Time (Days)	Cost (Rs.)	Time (Days)
A	-	200	3	400	2
B	-	250	8	700	5
C	-	320	5	380	4
D	A	410	0	800	4
E	C	600	2	670	1
F	B,E	400	6	950	1
G	B,E	550	12	1000	6
H	D	300	11	400	9

- a. Draw Network Diagram and determine critical path.

Suitably crash the activities so that the normal duration may be reduced.

### Question No. 5

- 5a) XYZ Company is considering three options for managing its data processing operations, continuing with own staff, outsourcing or the use of combination. The annual profit of each option depends on demand as follows: (8) CO5

Staffing Option	Demand Profit (Rs.)		
	High	Medium	Low
Own Staff	650	650	600
Outsourcing	900	600	300

Combination	800	650	500
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Determine Optimal Strategy for:

1. Maximin Criterion
2. Laplace Criterion
3. Hurwicz Criterion ( $\alpha = 0.6$ )
4. Regret Salvage

**OR**

- 5b) A retailer purchases cherries every morning at Rs. 50 a case and sells them for Rs. 80 a case. Any case that remains unsold at the end of the day can be disposed of the next day at a salvage value of Rs. 20 per case (thereafter they have no value). Past sales have ranged from 15 to 18 cases per day. The following is the record of sales for the past 120 days. (8) CO5

<b>Cases Sold</b>	15	16	17	18
<b>Number of days</b>	12	24	48	36

Find out how many cases should the retailer purchase per day in order to maximize his profit.

- 5c) Solve the following game and find the saddle point (Game Value). (8) CO5

	PLAYER B					
		<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>
	<b>A1</b>	3	5	4	9	6
	<b>A2</b>	5	6	3	7	8
	<b>A3</b>	8	7	9	8	7
	<b>A4</b>	4	4	8	5	3

Is it a fair game? Is it Strictly determinable?

**OR**

- 5d) Determine the optimal strategies for A & B in the following game. Obtain value of game. (8) CO5

PLAYER A	PLAYER B			
		<b>B1</b>	<b>B2</b>	<b>B3</b>
	<b>A1</b>	9	8	-7
	<b>A2</b>	3	-6	4

A3	6	7	7

..... End of question paper.....