Model Answer
End-Sem Examination-I, Winter 2025

Academic Year: 2025-2026	Semester: Sem III
Class: PG I	Program: MBA
Branch Code: 10	Pattern: 2024
Name of Course: Decision Science	Course Code: 2410506

Q. No.	Details	Max. Marks
Q. 1	Discuss about the different types of quantitative models used in business. (6 marks)	[6]

Students can explain any few of the models

1. Function
   - Descriptive
   - Predictive
   - Normative
2. Structure
   - Iconic
   - Analog
   - Symbolic
3. Dimensionality
   - Two-dimensional
   - Multidimensional
4. Degree of certainty
   - Certainty
   - Conflict
   - Risk
   - Uncertainty
5. Time reference
   - Static
   - Dynamic
6. Degree of generality
   - Specialized
   - General
7. Degree of closure
   - Closed
   - Open
8. Degree of quantification
   - Qualitative
     - Mental
     - Verbal
   - Quantitative
     - Statistical
     - Heuristic
     - Simulation

Q. No.	Details	Max. Marks
Q. 2	An airline Co. has drawn-up a new flight schedule involving five flights. To assist in allocating five pilots to the flights it has asked them to state their preference scores by giving each flight a number out of 10. The higher the number, the greater is the preference. Certain of these flights are unsuitable to some pilots owing to some domestic reasons. These have been marked with x. What should be the allocation of the pilots to flights in order to meet as many preferences as possible.	[6]

		Flight Number				
PILOT		**1**	**2**	**3**	**4**	**5**
	A	8	2	X	5	4
	B	10	9	2	8	4
	C	5	4	9	6	X
	D	3	6	2	8	7
	E	5	6	10	4	3

(6 marks)

This is a maximisation problem. First reduce it to minimisation by subtracting highest element with each element of the matrix. Resultant matrix and calculations are provided below.

Q2) =>

	1	2	3	4	5
A	2	8	M	5	6
B	0	1	8	2	6
C	5	6	7	4	M
D	7	4	8	2	3
E	5	4	0	6	7

Now the problem is Minimized apply Hugarian Method / Flood Technique.

Step-1 - Identify Row minimum & subtract with each element

	1	2	3	4	5
A	0	6	M	3	4
B	0	1	8	2	6
C	4	5	0	3	M
D	5	2	6	0	1
E	5	4	0	6	7

Step-2 Identify column minimum & subtract with each element

	1	2	3	4	5
A	0	5	M	3	3
B	0	0	8	2	5
C	4	4	0	3	M
D	5	1	6	0	0
E	5	3	0	6	6

Step-3 Assign zeros.

	1	2	3	4	5
A	[0]	5	M	3	3
B	⊘	[0]	8	2	5
C	4	4	[0]	3	M
D	5	1	6	[0]	⊘
E	5	3	⊘	6	6

Step-4 optimality criteria

[0]	5	M	3	3	
⊘	[0]	8	2	5	
4	4	[0]	3	M	← R2
5	1	6	[0]	⊘	
5	3	⊘	6	6	← R1
		C1			

Here K = 3

∴

0	5	M	3	3
0	0	11	2	5
1	1	0	0	M
5	1	9	0	0
2	0	0	3	3

Step-5 Row minimum

∴

0	5	M	3	3
0	0	11	2	5
1	1	0	0	M
5	1	9	0	0
2	0	0	3	3

Step 6- Column minimum

0	5	M	3	3
0	0	11	2	5
1	1	0	0	M
5	1	9	0	0
2	0	0	3	3

Step-7 Assign zeros.

[0]	5	M	3	3
⊘	[0]	11	2	5
1	1	⊘	[0]	M
5	1	9	⊘	[0]
2	⊘	[0]	3	3

All the zero are assigned
∴ For optimal solution

Pilot	No. of Flight		
A	1	→	8
B	2	→	9
C	4	→	6
D	5	→	7
E	3	→	10
			40

∴ The allocation of pilots to be [40]

Q. 3 a) Goods have to be transported from sources S1, S2, and S3 to destinations D1, D2, and D3. The transportation cost per unit, capacities of the sources, and the requirements of the destinations are given in the following table: [16] 8+8

	D1	D2	D3	D4	Supply
S1	2	3	11	7	6
S2	1	0	6	1	1
S3	5	8	15	9	10
Demand	7	5	3	2	

Determine the initial feasible solution (NWC, LCM, VAM) so that cost is minimised.

(8 marks)

(a) ***North-West Corner Rule***

Distribution Centre

		D_1	D_2	D_3	D_4	Supply
	P_1	2 (6)	3	11	7	$6 = a_1$
Plant	P_2	1 (1)	0	6	1	$1 = a_2$
	P_3	5	8 (5)	15 (3)	9 (2)	$10 = a_3$
Demand		$7 = b_1$	$5 = b_2$	$3 = b_3$	$2 = b_4$	

Total cost = Rs (2 × 6 + 1 × 1 + 8 × 5 + 15 × 3 + 9 × 2) × 100 = Rs 11,600

(b) ***Least Cost Method***

Distribution Centre

		D_1	D_2	D_3	D_4	Supply
	P_1	2 (6)	3	11	7	6
Plant	P_2	1	0 (1)	6	1	1
	P_3	5 (1)	8 (4)	15 (3)	9 (2)	10
Demand		7	5	3	2	

Total cost = Rs (2 × 6 + 5 × 1 + 8 × 4 + 15 × 3 + 9 × 2) × 100 = Rs 11,200

(c) ***Vogel's Approximation Method:*** First calculating penalties as per rules and then allocations are made in accordance of penalties as shown in Table 9.8.

		D_1	D_2	D_3	D_4	Supply	Row penalty		
	P_1	2 (1)	3 (5)	11	7	6	1	1	5
Plant	P_2	1	0	6	1 (1)	1	0	–	–
	P_3	5 (6)	8	15 (3)	9 (1)	10	3	3	4
Demand		7	5	3	2				
Column penalty		1	3	5	6				
		3	5	4	2				
		3	–	4	2				

Distribution Centre

Total cost = Rs (2 × 1 + 3 × 5 + 1 × 1 + 5 × 6 + 15 × 3 + 9 × 1) × 100 = Rs 10,200

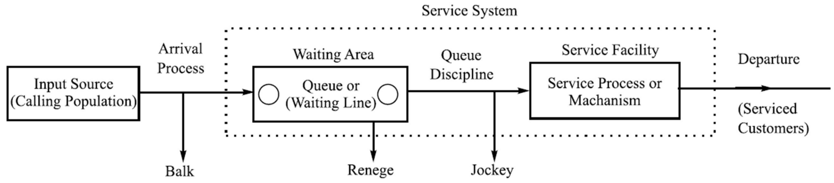
OR

b) Explain the concept of Queuing theory - System, Terminologies and Formulas.

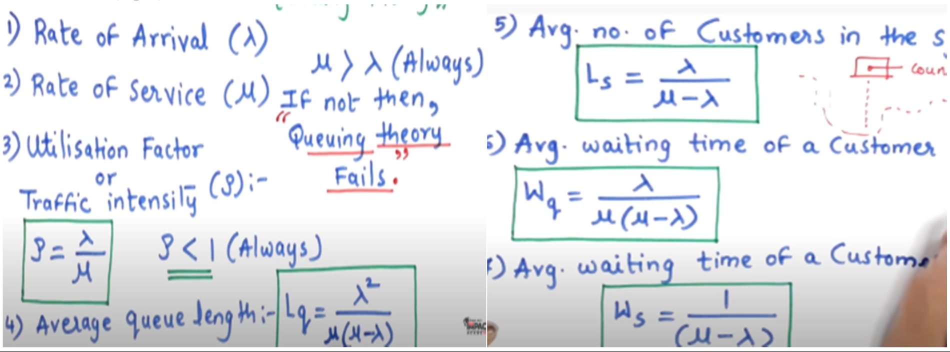
16.2 THE STRUCTURE OF A QUEUING SYSTEM

The major components (parts or elements) of any waiting-line (queuing) system are shown in Fig. 16.2. Each of these components is discussed below:

1. Calling population (or input source)
2. Queuing process
3. Queue discipline
4. Service process (or mechanism)



Potential customers who arrive to the queuing system is referred as *calling population*, also known as *customer (input) source*.



c) A company has factories at $F1$, $F2$, and $F3$ that supply products to warehouses at $W1$, $W2$ and $W3$. The weekly capacities of the factories are 7, 9 and 18 units, respectively. The weekly warehouse requirements are 5, 8, 7 and 14 units, respectively. The unit shipping costs (in rupees) are as follows:

Warehouse	*Factory*				
		W1	W2	W3	W4
	F1	19	30	50	10
	F2	14	8	18	60
	F3	26	24	16	20

Determine the optimal distribution for this company in order to minimize its total shipping cost.

(8 marks)

	D_1	D_2	D_3	D_4	*Supply*	*Row differences*
S_1	19 (5)	30	50	10 (2)	7	9 9 40 40
S_2	70	30	40 (7)	60 (2)	9	10 20 20 20
S_3	40	8 (8)	70	20 (10)	18	12 20 50 –
Demand	5	8	7	14	34	
Column differences	21 21 – –	22 – – –	10 10 10 10	10 10 10 50		

The new row and column penalties are calculated except column D_2 because D_2's demand has been satisfied. In the second round, the largest penalty, 21 appears at column D_1. Thus the cell (S_1, D_1) having the least transportation cost is chosen for allocating 5 units as shown in Table 9.5. After adjusting the supply and demand in the table, we move to the third round of penalty calculations.

In the third round, the maximum penalty 50 appears at row S_3. The maximum possible allocation of 10 units is made in cell (S_3, D_4) that has the least transportation cost of 20 as shown in Table 9.5.

The process is continued with new allocations till a complete solution is obtained. The initial solution using VAM is shown in Table 9.5. The total transportation cost associated with this method is:

Total cost = 5 × 19 + 2 × 10 + 7 × 40 + 2 × 60 + 8 × 8 + 10 × 20 = Rs 779

	D_1	D_2	D_3	D_4	*Supply*	u_i
S_1	19 (5)	30 +32	50 + 60	10 (2)	7	$u_1 = 10$
S_2	70 + 1	30 (+) – 18	40 (7)	60 (2) (–)	9	$u_2 = 60$
S_3	40 + 11	8 (–) (8)	70 + 70	20 (10) (+)	18	$u_3 = 20$
Demand	5	8	7	14	34	
v_j	$v_1 = 9$	$v_2 = -12$	$v_3 = -20$	$v_4 = 0$		

$$c_{34} = u_3 + v_4 \quad \text{or} \quad 20 = u_3 + 0 \quad \text{or} \quad u_3 = 20$$
$$c_{24} = u_2 + v_4 \quad \text{or} \quad 60 = u_2 + 0 \quad \text{or} \quad u_2 = 60$$
$$c_{14} = u_1 + v_4 \quad \text{or} \quad 10 = u_1 + 0 \quad \text{or} \quad u_1 = 10$$

Given u_1, u_2, and u_3, value of v_1, v_2 and v_3 can also be calculated as shown below:

$$c_{11} = u_1 + v_1 \quad \text{or } 19 = 10 + v_1 \text{ or } v_1 = 9$$
$$c_{23} = u_2 + u_3 \quad \text{or } 40 = 60 + v_3 \text{ or } v_3 = -20$$
$$c_{32} = u_3 + v_2 \quad \text{or } 8 = 20 + v_2 \text{ or } v_2 = -12$$

Total cost = 5 × 19 + 2 × 10 + 2 × 30 + 7 × 40 + 6 × 8 + 12 × 20 = Rs 743

	D_1	D_2	D_3	D_4	*Supply*
S_1	19 (5)	30 +32	50 +42	10 (2)	7
S_2	70 + 19	30 (2)	40 (7)	60 +14	9
S_3	40 + 11	8 (6)	70 + 52	20 (12)	18
Demand	5	8	7	14	34
v_j	$v_1 = 19$	$v_2 = -2$	$v_3 = 8$	$v_4 = 10$	

OR

d) i) 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.

ii) Discuss the importance of Transportation Problem and Queuing Theory in management field with examples.

From the data of the problem,

(1) $\lambda = \frac{30}{60} \times \frac{1}{24} = \frac{1}{48}$ trains per minute

(2) $\mu = \frac{1}{36}$ trains per minute

(3) $L_q = \frac{\lambda^2}{\mu(\mu-\lambda)} = \frac{\frac{1}{48} \times \frac{1}{48}}{\frac{1}{36}\left(\frac{1}{36} - \frac{1}{48}\right)} = \frac{\frac{1}{48 \times 48}}{\frac{1}{36}\left(\frac{12}{48 \times 36}\right)}$

$= \frac{9}{4} = 2.25 \approx 2$ trains

(4) $W_q = \frac{\lambda}{\mu(\mu-\lambda)} = \frac{\frac{1}{48}}{\frac{1}{36}\left(\frac{12}{48 \times 36}\right)} = 108$ minutes.

ii) Discuss the importance of Transportation Problem and Queuing Theory in management field with examples.

Students are expected to write based on the importance discussed or anything below.

Technique	Example Scenario	Key Outcome	Management Benefit
Transportation Problem	Multi-warehouse e-commerce distribution	15% cost reduction	Efficient supply-demand matching
Queuing Theory	Mining truck fleet optimization	66.6% idle time utilization	Reduced operational delays
Transportation Problem	Steel raw material procurement	12% cost savings, 90% on-time rate	Optimized supplier selection

	Queuing Theory	Highway toll plaza operations	Waiting time cut to 5 minutes	Improved traffic flow	

Q. 4

a) A project has been defined to contain the following list of activities along with their required time of completion.

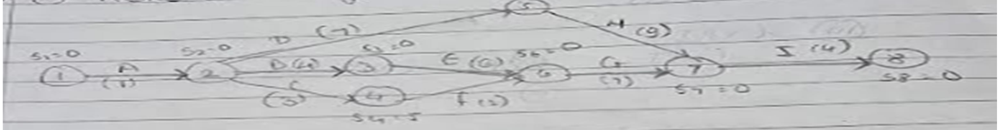
Activity	A	B	C	D	E	F	G	H	I
Time in Days	1	4	3	7	6	2	7	9	4
Immediate Predecessor	-	A	A	A	B	C	E, F	D	G, H

I. Draw the network diagram.
II. Show early start time and early finish time.
III. Identify critical path.
IV. What would happen if duration of activity F is taken as four days instead of two?

[16]

8+8

(i) Network Diagram



(ii) Forward Pass method.

$E_j = E_i + t_{ij}$

$E_1 = 0$

$E_2 = E_1 + t_{1,2} = 0 + 1 = 1$

$E_3 = E_2 + t_{2,3} = 1 + 4 = 5$

$E_4 = E_2 + t_{2,4} = 1 + 3 = 4$

$E_5 = E_2 + t_{2,5} = 1 + 7 = 8$

$E_6 = E_3 + t_{3,6} = 5 + 6 = 11$ ✓ } max

$= E_4 + t_{4,6} = 4 + 2 = 6$

$E_7 = E_5 + t_{5,7} = 8 + 9 = 17$

$= E_6 + t_{6,7} = 11 + 7 = 18$ ✓ } max

$E_8 = E_7 + t_{7,8} = 18 + 4 = 22$

(iii) Backward Pass method

$L_j = L_i + t_{ij}$

$L_8 = E_8 = 22$

$L_7 = L_8 - t_{7,8} = 22 - 4 = 18$

$L_6 = L_7 - t_{6,7} = 18 - 7 = 11$

$L_5 = L_7 - t_{5,7} = 18 - 9 = 9$

$L_4 = L_6 - t_{4,6} = 11 - 2 = 9$

$L_3 = L_6 - t_{3,6} = 11 - 6 = 5$

$L_2 =$

$L_2 = L_5 - t_{2,5} = 9 - 7 = 2$
$= L_3 - t_{2,3} = 5 - 4 = 1$ ✓ } min^m
$= L_4 - t_{2,4} = 9 - 3 = 6$
$L_1 = L_2 - t_{1,2} = 1 - 1 = 0$

(iv) Calculate Slack.
$S_i = L_i - E_i$
$S_1 = 0 - 0 = 0$, $S_2 = 1 - 1 = 0$, $S_3 = 5 - 5 = 0$
$S_4 = 9 - 4 = 5$, $S_5 = 9 - 8 = 1$,
$S_6 = 11 - 11 = 0$, $S_7 = 18 - 18 = 0$
$S_8 = 22 - 22 = 0$

(v) Total completion time = 22 days.
Critical path is.
∴ 1 - 2 - 3 - 6 - 7 - 8
A - B - E - G - I

IV. If F is taken as 4 instead of 2, then E6 will be yet 11. But L4 would be 7 and slack would be 2. This reduces the slack of event 4, making it less flexible compared to earlier time.

OR

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

Activity	**1-2**	**1-3**	**1-4**	**2-5**	**3-5**	**4-6**	**5-6**
Pessimistic Time	7	7	12	15	1	8	7
Most Likely Time	6	1	4	6	1	2	4
Optimistic Time	5	1	2	3	1	2	1

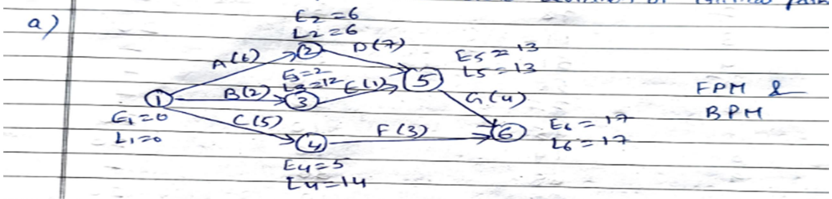
Draw network diagram. Find out Critical path & Project duration. Estimate expected Standard deviation of critical path.

(In weeks)

Activity	tp	tm	to	$t_e = \frac{t_o+4t_m+t_p}{6}$
1-2 (A)	7	6	5	6
1-3 (B)	7	1	1	2
1-4 (C)	12	4	2	5
2-5 (D)	15	6	3	7
3-5 (E)	1	1	1	1
4-6 (F)	8	2	2	3
5-6 (G)	7	4	1	4

a) Draw Network diagram
b) Find out critical path and Project duration
c) Estimate Expected standard deviation of critical path

a)



b) Critical path is 1-2-5-6. Project duration is 17 weeks.

c) $\sigma^2 = \left[\frac{1}{6}(t_p - t_o)\right]^2$

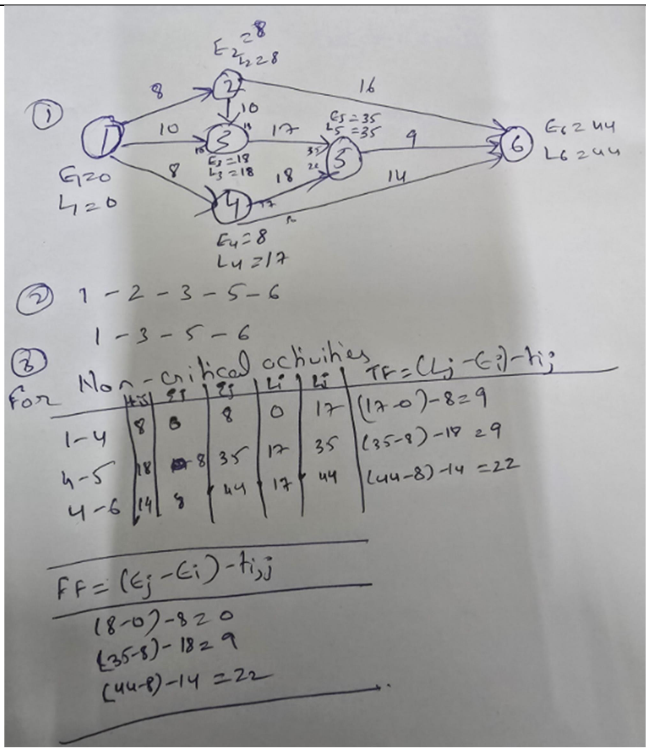
A — $\frac{2}{6} = 0.33$
B — 1
C — $\frac{10}{6} = 1.66$
D — $\frac{12}{6} = 2$
E — 0
F — $\frac{6}{6} = 1$
G — $\frac{6}{6} = 1$.

c) The activities of a project an estimated times in days for each activity are given below:

Activity	1-2	1-3	1-4	2-3	2-6	3-5	4-5	4-6	5-6
Duration (in days)	8	10	8	10	16	17	18	14	9

i) Draw network diagram ii) Find critical path iii) Calculate total float and free float

(8 marks)



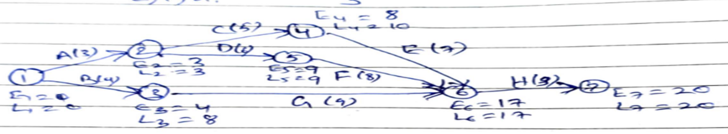
OR

d) A Company manufacturing plant and equipment for chemical processing is in the process of quoting a tender called by a public sector undertaking. Th 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:

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

Activity		Time $\left(\frac{t_o + 4t_m + t_p}{6}\right)$
A	—	3
B	—	4
C	A	5
D	A	6
E	C	7
F	D	8
G	B	9
H	E, F, G.	3



Critical path = 1–2–5–6–7.

~~Non-critical~~

Non-critical Activity	Duration	E_i	E_j	L_i	L_j	TF	FF
1-3 (B)	4	0	4	0	8	4	0
2-4 (C)	5	3	8	3	10	2	0
4-6 (E)	7	8	17	10	17	0	2
3-6 (G)	9	4	17	8	17	4	4

$TF = (L_j - E_i) - t_{i,j}$

$FF = (E_j - E_i) - t_{i,j}$

Q. 5 [16] 8+8

a) Solve the following game

Player A	Player B		
	B1	B2	B3
A1	1	7	2
A2	6	2	7
A3	5	1	6

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Player A	B_1	B_2	B_3
A_1	1	7	2
A_2	6	2	7
A_3	5	1	6

(Row Min)

Step 1 :- Applying the rule of finding saddle point.

	B_1	B_2	B_3	(Row Minimum)
A_1	1	7	2	1
A_2	(6)	[2]	7	[2] ← Maximin
A_3	5	1	6	1
Column Maximum	(6) Minimax	7	7	

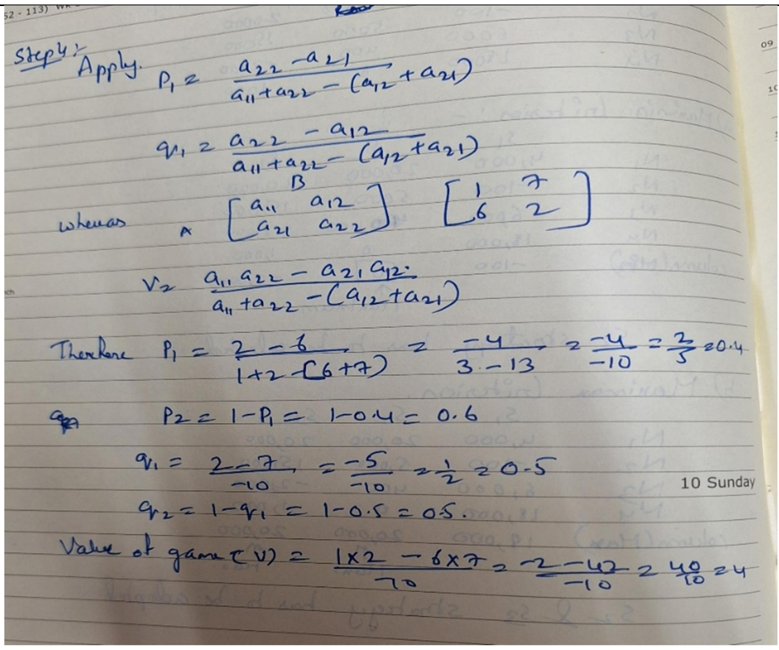
There is no saddle point. So, apply rule of dominance.

Step 2 :- First step compare columns :-
B_3 dominates B_1. So, Remove column B_3.
Resultant pay-off matrix is :-

	B_1	B_2
A_1	1	7
A_2	6	2
A_3	5	1
	6	7

Step 3 :- Check for rows. A_3 dominates A_2. Remove row A_3.
Resultant matrix is

	B_1	B_2
A_1	1	7
A_2	6	2.


Step 4: Apply. $P_1 = \frac{a_{22} - a_{21}}{a_{11} + a_{22} - (a_{12} + a_{21})}$

$q_1 = \frac{a_{22} - a_{12}}{a_{11} + a_{22} - (a_{12} + a_{21})}$

whereas A $\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ B $\begin{bmatrix} 1 & 7 \\ 6 & 2 \end{bmatrix}$

$V = \frac{a_{11} a_{22} - a_{21} a_{12}}{a_{11} + a_{22} - (a_{12} + a_{21})}$

Therefore $P_1 = \frac{2 - 6}{1 + 2 - (6 + 7)} = \frac{-4}{3 - 13} = \frac{-4}{-10} = \frac{2}{5} = 0.4$

$P_2 = 1 - P_1 = 1 - 0.4 = 0.6$

$q_1 = \frac{2 - 7}{-10} = \frac{-5}{-10} = \frac{1}{2} = 0.5$

$q_2 = 1 - q_1 = 1 - 0.5 = 0.5.$

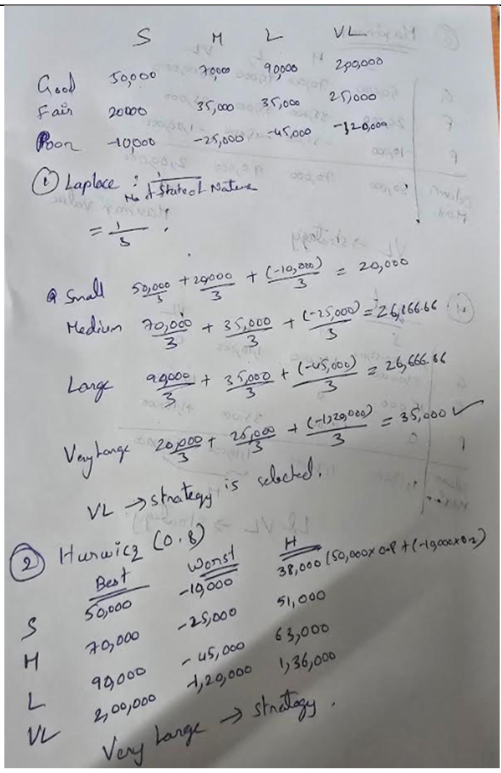
Value of game (V) $= \frac{1 \times 2 - 6 \times 7}{-10} = \frac{2 - 42}{-10} = \frac{40}{10} = 4$

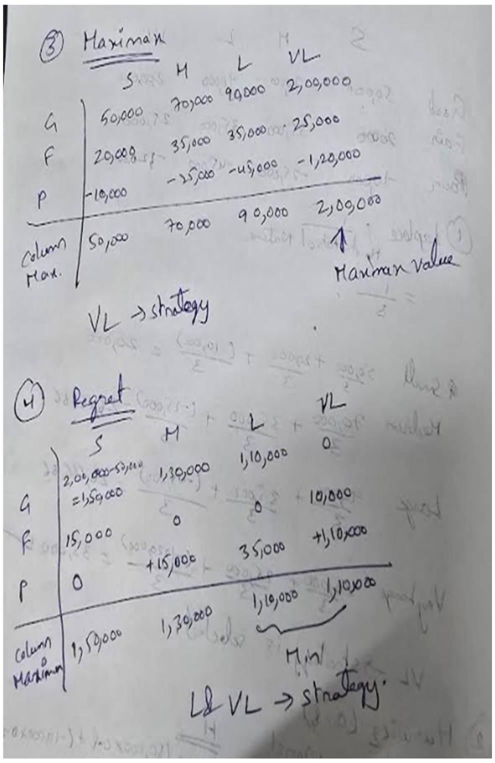
OR

b) Dr. Kelkar has been thinking about starting his own independent nursing home. The problem is to decide how large the nursing home should be. The annual returns will be depending on both size of nursing home and number of marketing factors. after a careful analysis, Dr. Kelkar developed following table:

Size of Nursing Home	Good Market (Rs.)	Fair Market (Rs.)	Poor Market (Rs.)
Small	50,000	20,000	-10,000
Medium	70,000	35,000	-25,000
Large	90,000	35,000	-45,000
Very Large	2,00,000	25,000	-1,20,000

Find optimal strategy using i) Laplace ii) Hurwicz (a-0.8) iii) Maximax iv) Regret





c) A company decides on production allocation of 1000 units across three plants (A:400, B:350, C:250 max capacity) to two markets (X:500, Y:600 demand) under uncertain demand scenarios. Strategies: S1 (prioritize X), S2 (balance), S3 (prioritize Y). Profits per scenario: Strong X demand (prob 0.4), Balanced (0.3), Strong Y (0.3).

Payoff Table (Profits $000s)

Strategy /Scenario	**Strong X (0.4)**	**Balanced (0.3)**	**Strong Y (0.3)**
S1 (Prioritize X)	240	180	120
S2 (Balance)	220	200	180
S3 (Prioritize Y)	160	170	240

Calculate EMV, EOL and EVPI.

(8 marks)

EMV Calculations

Expected Monetary Value maximizes expected profit.

S1 EMV = (0.4)(240) + (0.3)(180) + (0.3)(120) = 96 + 54 + 36 = 186.

S2 EMV = (0.4)(220) + (0.3)(200) + (0.3)(180) = 88 + 60 + 54 = 202 (optimal).

S3 EMV = (0.4)(160) + (0.3)(170) + (0.3)(240) = 64 + 51 + 72 = 187.

Regret Table & EOL

Regret = Max column payoff minus strategy payoff.

Strong X regrets: 0/20/80;

Balanced: 30/0/30;

Strong Y: 120/60/0.
EOL S1 = (0.4)(0) + (0.3)(30) + (0.3)(120) = 0 + 9 + 36 = 45.
EOL S2 = (0.4)(20) + (0.3)(0) + (0.3)(60) = 8 + 0 + 18 = 26 (minimum).
EOL S3 = (0.4)(80) + (0.3)(30) + (0.3)(0) = 32 + 9 + 0 = 41.
EVPI=EPPI-EMV*
EPPI = (0.4)(240) + (0.3)(200) + (0.3)(240) = 96 + 60 + 72 = 228. EVPI = 228 - 202 = 26 (matches min EOL).

OR

d) Determine the optimal strategies for A & B in the following game. Obtain value of game.

		PLAYER B		
PLAYER A		**B1**	**B2**	**B3**
	A1	9	8	-7
	A2	3	-6	4
	A3	6	7	7

	B1	B2	B3
A1	9	8	-7
A2	3	-6	4
A3	6	7	7

Step1:- Maximin & Minimax value

	B_1	B_2	B_3	Row(Min)
A_1	9	8	-7	-7
A_2	3	-6	4	-6
A_3	(6)	7	[7]	6 ← Max.(Maximin Value)
column (Max)	9	8	7 ↑min Minimax value	

As the maximin value ≠ minimax value.
This game is without saddle point.

CG&RL

Step2:- Apply rule of dominance to row(PlayerA)
Row $A_2 \leq$ Row $A_3 \Rightarrow A_2$ is dominating
Eliminate A_2:

Resultant matrix is :-

	B_1	B_2	B_3
A_1	9	8	-7
A_3	6	7	7

Step3:- Apply rule of dominance to column(PlayerB)
Column $B_2 \geq$ Column $B_3 \Rightarrow B_2$ is dominating
Eliminate B_2.

Resultant matrix is:-

	B_1	B_3
A_1	$9^{a_{11}}$	$-7^{a_{12}}$
A_3	$6^{a_{21}}$	$7^{a_{22}}$

$P_1 = \frac{a_{22}-a_{21}}{a_{11}+a_{22}-(a_{21}+a_{12})} = \frac{7-(+6)}{9+7-(6-7)} = \frac{1}{17}$ $\quad P_2 = \frac{16}{17}\ (1-P_1)$

$q_1 = \frac{a_{22}-a_{12}}{a_{11}+a_{22}-(a_{21}+a_{12})} = \frac{7-(-7)}{17} = \frac{14}{17}$ $\quad q_2 = 1-q_1 = \frac{3}{17}$

$V = \frac{a_{11}a_{22}-a_{21}a_{12}}{a_{11}+a_{22}-(a_{21}+a_{12})} = \frac{63+(42)}{17} = \frac{105}{17}$