Tribhuvan University
Institute of Science and Technology
SCHOOL OF MATHEMATICAL SCIENCES
First Assessment 2079

Subject: **Decision Analysis** *Full Marks*: 45
Course No: **MDS 606** *Pass Marks*: 22.5
Level: **MDS /II Year /III Semester** *Time*: 2hrs

Candidates are required to give their answers in their own words as far as practicable.

Attempt All Questions.

Group A **[3 ×5 = 15]**

1. Define Goal Programming. Distinguish between Linear programming problem and Goal programming.
2. What is conditional probability? State Bayes theorem up to 3 events.
3. A trader has two investment opportunities, A and B available to him but does not have enough capital to invest in the both. The probability of success on A is 0.70 while that on B is 0.40. Both the investments require an initial capital of Rs.20000 and both return nothing if the venture is not successful. Investment A returns Rs.30000 over cost if it is successful, whereas the successful completions of B will return Rs.50000 over cost. Using EMV criterion decide the best strategies the trader should adopt.
4. Explain the risk preferences and shape of the utility function.
5. What are the decision making under ignorance? Explain them with suitable examples.

Group B **[5 × 6 = 30]**

6. What are the five criteria of decision making under condition of uncertainty? Explain them with suitable examples.
7. A newspaper vendor buys a new started local paper at the rate of Rs.5 and sells it at the rate of Rs.10. The unsold papers do not have any value. The vendor knows that he cannot sell more than 20 papers in a day and the minimum sale would not be less than 18. How many papers should he buy based on (i) maximax criterion (ii) maximin criterion (iii) minimax regret criterion (iv) Laplace criterion and (v) criterion of realism if coefficient of optimism is 0.60?
8. A distribution of past daily sales of a commodity is as follows:

Daily sales (units)	1000	1200	1400	1600	1800
Probability	0.05	0.15	0.35	0.30	0.15

If selling price per unit is Rs.40 and cost price per unit is Rs.25 and salvage price per unit is Rs.5, what is
   a) optimum quantity?
   b) maximum expected profit?
   c) expected values for perfect information?
9. There are three varieties of machines viz. A, B and C of which any one is to be purchased by a firm. The profits expected from the different machines under different markets conditions are tabulated as under:

Profit matrix (in '000 Rs.)

Market	Machine		
	A	B	C
Poor	0.50	0.00	−1.50
Fair	1.00	1.50	0.50
Good	1.50	2.50	3.50

(Q, 1)

The probabilities of the market being poor, fair, and good were estimated by the firm to be 0.3, 0.5 and 0.2 respectively. But a research group opined that these probabilities can not to be relied upon to be accurate and they assessed the following chances after a careful survey of the market conditions.

Actual state	Indicated state		
	Poor	Fair	Good
Poor	0.7	0.2	0.1
Fair	0.2	0.7	0.1
Good	0.0	0.2	0.8

From the above particulars

a) Construct the expected opportunity loss table basing on the market assessment made by the firm and determine the optimal act using EOL criterion. Also, determine the EVPI there from.

b) Construct the EOL table basing upon the information furnished by the research group and determine the net revised EOL (i.e. AMEOL) thereby.

c) State the maximum amount that should be spent after the market research.

d) Also, find the expected net gain from the sampling (ENGS), if the decision maker is prepared to obtain additional information for Rs.110.

10. *Solve the following LPP graphically or simplex method:*

Maximize $Z = 3x_1+9x_2$

Subject to the constraints

$x_1 + 2x_2 \leq 4$

$x_1 + 4x_2 \leq 8$

and $x_1, x_2 \geq 0$

***

Tribhuvan University
Institute of Science and Technology
SCHOOL OF MATHEMATICAL SCIENCES
Second assessment 2079

Subject: **Decision Analysis**
Course No: **MDS 606**
Level: **MDS/II Year/III Semester**

Full Marks: **45**
Pass Marks: **22.5**
Time: **2hrs**

Candidates are required to give their answer in their own words as far as practicable.

Attempt ALL questions.

Group A [5×3=15]

1. What is goal programming problem? Distinguish between LPP and GP.

2. Determine the saddle point solution, the associated pure strategies and the value of the game for the following game. The payoff matrix for player A is given by

Player A	Player B			
	B_1	B_2	B_3	B_4
A_1	8	6	2	8
A_2	8	9	4	5
A_3	7	5	3	5

3. *An office equipment manufactures produces two kinds of products chair and lamp. Production of either requires one hour of production capacity in the plant. The plant has a maximum production capacity* of 50 hours per week because of the limited sales capacity, the maximum number of chairs and lamps that can be sold are 6 and 8 respectively. The gross margin from sale of chair is 90 and 60 for a lamp. The plant manager desires to determine the number of units of each product that should be produced per week in consideration of the following equally ranked goals.
   - **Goal 1:** Available production capacity should be utilized as much as possible but not exceeded.
   - **Goal 2:** Sales of two products should be as much as possible.
   - **Goal 3**: Overtime should not exceed 20% of available production time.

   Formulate the problem as a Goal programming.
4. Distinguish between risk appetite and risk tolerance.
5. Explain about decision making philosophies.

Group B [5×6=30]

6. Find the optimal strategies using the dominance rule for player A and B in the following game. Also obtain the value of the game.

Player A's Strategy	Player B's Strategy		
	B_1	B_2	B_3
A_1	−3	−2	4
A_2	−1	4	2
A_3	2	2	6

7. A company manufactures two products radio and transistors which must be processed through assembly and finishing departments. Assembly has 90 hours available; finishing can handle up to 72 hours of work. Manufacturing one radio requires 6 hours in assembly and 3 hours in finishing. Each transition requires 2 hours in assembly and 4 hours in finishing. If profit is 1.20 per radio and 1.90 per transistor, determine the best combination of radios and transistors to realize a maximum profit of 2000. Formulate a problem as a GP problem and solve it.

OR

A company manufactures two products radio and transistors which must be processed through assembly and finishing departments. Assembly has 90 hours available; finishing can handle up to 72 hours of work. Manufacturing one radio requires 6 hours in assembly and 3 hours in finishing. Each transition requires 2 hours in assembly and 4 hours in finishing. If profit is 1.20 per radio and 1.90 per transistor, determine the best combination of radios and transistors to realize a maximum profit of 2000. Formulate a problem as a GP problem and solve it.

8. What is decision analysis? Describe the various steps of decision making processes.

OR

Describe about the different types of decision theories with suitable examples.

9. What is Enterprise Risk Management? Explain briefly about COSO: Integrated Framework and their components.

10. Use dominance rule to reduce the size of the following game to 2×2 game and hence find the optimal strategies and the value of the game.

Player A	Player B		
	B_1	B_2	B_3
A_1	2	2	3
A_2	-3	-1	1
A_3	25	2	-1

***

Tribhuvan University
Institute of Science and Technology
2079

Master Level / Second Year /Third Semester/ Science
Data Science (MDS 606)
(Decision Analysis)

Full Marks: 45
Pass Marks: 22.5
Time: 2 hours

Candidates are required to give their answers in their own words as for as practicable.

Attempt All Questions

Group A (5×3=15)

1. Explain different types of decisions in brief.

2. A man has the choice of running either a hot -snack stall or an ice-cream stall at a sea side resort during the summer season. If it is a fairly cool summer, he should make Rs.5000 by running the hot-snack stall, but if the summer is quite hot, he can only expect to make Rs.1000. On the other hand, if he operates the ice-creams stall, his profit is estimated at Rs.6500 if the summer is hot, but only Rs.1000 if it is cool. There is a 40% chance of the summer being hot. What should be his decision to maximize expected profit by using EMV criterion?

3. Determine the saddle point solution, the associated pure strategies and the value of the game for the following game. The payoff matrix for player A is given by

Player A	Player B		
	B_1	B_2	B_3
A_1	15	2	3
A_2	6	5	7
A_3	-7	4	0

4. Define goal programming. Distinguish between Linear programming problem and goal programming.

5. Write down current trends in Enterprise Risk Management (ERM).

Group B (5×6=30)

6. Define group decision making. Describe the techniques of group decision making.

OR

Describe about the different types of decision theories with suitable examples.

7. A distribution of past sales of a commodity for ABC Enterprises is as follows:

Quantities buyer's bought	20 units	25 units	40 units	60 units
Probability	0.10	0.30	0.50	0.10

ABC Enterprises buys these for Rs.6 and sells them for Rs.10.

a) What quantities should be bought to maximize expected profits?

b) What is the Expected Profit with Perfect Information (EPPI)?

c) What is the Expected Value with Perfect Information (EVPI)?

OR

The captain's table is a mail-order distributor of fresh lobsters. The company buys these for Rs.4 per pound and sells them for Rs.7.50 per pound. The per week shipment distribution is as follows:

Shipments per week, pound	3000	5000	8000	12000	18000
Probability of occurrence	0.05	0.20	0.20	0.40	0.15

The company has been approached by a consulting of firm specializing in sales forecasting. The firm has offered to provide the captain's table with a sales-forecasting model, which will increase the distributor's present profit by matching purchases with sales. The cost of buying and running this model will be Rs.7500 a week. Should the company buy it?

8. The following matrix gives the payoff of different strategies (alternatives) S_1, S_2, S_3 against states of nature (events) D_1, D_2, D_3, and D_4

Strategies	States of nature			
	D_1 (Rs.)	D_2 (Rs.)	D_3 (Rs.)	D_4 (Rs.)
S_1	4000	-100	6000	18000
S_2	20000	5000	400	0
S_3	20000	15000	-2000	1000

Indicate the decision taken under the following approach:

a) Pessimistic criterion b) Optimistic criterion c) Minimax regret criterion

d) Laplace criterion e) Hurwitz criterion.

Assume that the coefficient of optimism (α) is 0.60.

9. In a game of matching coins with two players A and B, suppose A wins 2 units of value when there are two heads, wins nothing when there are two tails and losses 1 unit of value when there is one head and one tail. Determine the payoff matrix, the best strategies for each player and the value of the game to A.

10. Solve the following Goal Programming (GP) by simplex method, Minimize $Z = d_1^-$

Subject to the constraints $2x_1 + x_2 \leq 6$, $x_1 + x_2 \leq 4$, $4x_1 + 8x_2 + d_1^- - d_1^+ = 100$ and $x_1, x_2, d_1^-, d_1^+ \geq 0$.