Subject: Quantitative Decision Making   **Duration:** 60 Minutes

Faculty: Prof. Diptesh Ghosh   **Exam Date:** October 19, 2019

Attempt both questions

Question 1 (6 marks)

A cargo ship has two cargo holds, one fore and one aft. The fore cargo hold has a weight capacity of 40,000 kilos and a volume capacity of 30,000 cubic feet. The aft hold has a weight capacity of 45,000 kilos and a volume capacity of 40,000 cubic feet. The ship's owner has contracted to carry loads of refined cooking oil and grain. The total weights of the available oil and available grain are 60,000 kilos each, but the owner must arrange to carry at least 30,000 kilos each of oil and grain. The volume per mass of the oil is 0.4 cubic foot per kilo, and the volume per mass of the grain is 0.8 cubic foot per kilo. The profit for shipping oil is Rs.70 per kilo, and the profit for shipping grain is Rs.24 per kilo. The owner is free to accept all or part of the available cargo; he wants to know how much oil at and grain to accept to maximize profit.

(a) What is the maximum profit that the owner can make?
(b) How much weight of oil should the owner load in the fore cargo?
(c) How much weight of oil should the owner load in the aft cargo?
(d) How much weight of grain should the owner load in the fore cargo?
(e) How much weight of grain should the owner load in the aft cargo?
(f) If the owner is offered to take in cargo from another ship, what is the minimum rate (per kilo) that he should charge for such cargo?

P.T.O.

Question 2 (7 marks)

An oil Company is considering making a bid for an oil development contract to be awarded by the government. The company has decided to bid Rs.11.2 crore. The company estimates that it has a 60% chance of winning the contract with this bid. If the firm wins the contract, it can choose one of three methods for getting the oil. It can develop a new method for oil extraction, use an existing (inefficient) process, or subcontract the processing to a number of smaller companies. The results from these alternatives are as follows:

Develop new process:

Outcomes	Probability	Profit (Rs. crores)
Great success	0.3	60
Moderate success	0.6	30
Failure	0.1	−10

Use present process:

Outcomes	Probability	Profit (Rs. crores)
Great success	0.5	45
Moderate success	0.3	20
Failure	0.2	−4

Subcontract:

Outcome	Probability	Profit (Rs. crores)
Moderate success	1.0	25

The cost of preparing the contract proposal is Rs.2 crore. If the company does not make a bid, it will invest in an alternative venture with a guaranteed profit of Rs.30 crore.

(a) What would be the expected value of the profits to the company under the three alternatives?

(b) Which of the three alternatives should the company choose, if they decided to make a bid?

(c) Suppose the probability of moderate success for the present process remains at 0.3. What should be the probability of "Great success" for the company to be indifferent between the present process and the new process?

(d) Should the company invest in the alternate venture?

(e) What would be the expected profit for the company if they adopt their best decision?

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