Decision Modeling & Risk Analysis
Assignment #1

Due Thursday 26 June 2025 12 pm

Question (Total 50 marks)

A company is considering the development of a new advanced technology to manufacture a new product. The company has two ways to acquire the technology:

I. Self-develop the new technology at a cost of $50,000. The probability of success is estimated to be 0.6.

II. License and customize an existing technology for $100,000. The probability of success is estimated to be 0.8.

If the company fails to develop the new technology under either alternative, it will terminate the project and incur losses equal to the costs given above.

If the company succeeds in developing the technology under either alternative, it has a choice of either mass production, low-volume production, or terminating the project. The future demand for the product is uncertain. It will either be high with a probability of 0.75 or low with a probability of 0.25. The net profits/losses to the company, which include the initial technology development or acquisition costs, under different alternatives and outcomes, are given in the table below:

Product Demand	Self-Develop Technology		License and Customize Technology	
	Mass production	Low-volume production	Mass production	Low-volume production
High	600,000	200,000	300,000	100,000
Low	-400,000	-100,000	-200,000	-50,000

The company is **risk-neutral,** and the effect of the time value of money may be ignored.

(*a*) Draw a decision tree representing the company's problem. Determine the company's optimal decision policy and certainty equivalent. (15 marks)

(*b*) Plot the risk profiles for the two alternatives for the company's initial decision on a common graph paper. (5 marks)

(*c*) Is there any first stochastic dominance among the two alternatives? Explain your answers. (5 marks)

(*d*) What is the expected value of perfect information on whether self-developing technology will succeed? (10 marks)

(*e*) A market study can be conducted. The study, however, is imperfect as it is expected to perform as follows: If the market demand is going to be "High", the study will report it correctly with a probability of 0.85. On the other hand, if the market demand is going to be "Low", the study will report it correctly with a probability of 0.7. What is the maximum cost the company will spend on such a market study? (15 marks)