TIE4203 Decision Analysis in Industrial & Operations Management
Assignment #1
Due: Friday 15 Sep 2023 (end of class)

You may use Excel or any application software for your computations, but you must explain your solutions in the submission.
Submit your solutions at the drop box outside the ISEM Department Office at E1A-06-25 any time before the due date, or submit it to the lecturer/tutor at the end of class at LT52.

Total 25 marks

1. To evaluate the performance of a new quick diagnostic test for a new strain of Covid-19, the manufacturer performed a random trial on 100 people known to have the virus and 94 of them have positive test results. The test is also performed on 150 random control cases known to be free of the virus and 21 of them have positive test results. Based on these data, what is the sensitivity and specificity of the test? Express your answers to at least 4 decimal places. (10 marks)

2. Based on the symptoms shown by John, a doctor assessed that he has a 0.15 probability of being infected by virus *X*. A test is available for virus X and it has a sensitivity of 94% and a specificity of 86%.

(*a*) Suppose that the result for John came back positive. Based on all the information now available, what is the probability that John **is infected** by virus *X*? Express your answer to at least 4 decimal places. (5 marks)

(*b*) On the other hand, suppose that the result for John came back negative. Based on all the information now available, what is the probability that John **is not infected** by virus X? Express your answer to at least 4 decimal places. (5 marks)

3. The Centre for Infectious Diseases used a test with 94% sensitivity and 86% specificity to screen a population of 20,000 people that has a 10% prevalence rate for disease *Z*. What is the expected number of people in the population that will have test results that are correctly diagnosed? (5 marks)