

DSS5202 Sustainable Systems Analysis

Assignment #2

Due: 15 September 2025, 9 pm

Read these instructions first

You must show your workings before using computing tools to compute the final answers.

Show the formula that is being computed or the equation to be solved.

A direct copy-and-paste from Excel or Python financial function is not acceptable.

Submit your answers to this assignment as **one PDF file** via Canvas.

Question (Total 50 marks)

District cooling system provides better sustainability in the cooling of buildings by improving overall energy efficiency, lowering operational costs and reducing GHG emissions.

A company is considering the acquisition of a district cooling plant that produces chilled water for central air-conditioning systems in the central business district. The total investment cost is \$50 million. To fund the project, the company will take a 5-year bank loan of \$30 million and will pay it back with 5 equal end-of-year payments of \$7.5 million starting from the end of the first year. Another \$20 million of the investment cost will be funded through cash proceeds from the company's recent divestment of assets.

Annual profits from the sales of chilled water generated by the plant to commercial buildings in the district are estimated to be \$6 million per year in the first 10 years. Due to increased operations and maintenance costs and degraded efficiency as the plant ages, the annual profits are expected to be only \$5 million from year 11 to year 20 and \$4 million from year 21 to year 25. All cash flows are assumed to occur at the end of the year.

The plant has a useful life of 25 years with a salvage value of \$100,000. The company's *MARR* is 10%.

1. Draw a cash flow diagram for the project indicating all the cash flows at the end of each year. (10 marks)
2. What is the *Net Present Value (NPV)* of the project? Is the project financially feasible? (10 marks)
3. What is the *Internal Rate of Return (IRR)* of the project? Show the equation to be solved before using a solver. Is the project financially feasible? (10 marks)
4. Do you expect investment decisions for this project in Question 2 and Question 3 above to be always the same regardless of the company's *MARR*? Explain your answer. (10 marks)
5. What is the *Modified Internal Rate of Return (MIRR)* of the project if the financing rate is 8% and the reinvestment rate is 10%? Is the project financially feasible? (10 marks)