**Engineering Economics Fall 1398**
**Third Assignment – After-tax Analysis and Sensitivity Analysis**

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Consider a project for manufacturing of an innovative product with the following information.

- First Cost, including:
  - Working capital, i.e., required cash: B/4
  - Tools and materials: B/2
  - Production equipment: A
- Annual Operating costs, including:
  - Human resources: 3C for the first year and will be increased 15% annually
  - Materials: 2C for the first year and will be increased 10% annually
  - Overhead and other costs: C
- Annual Operating revenues:
  - 4B for the third year and will be increased 10% annually
- Salvage value:
  - 10% of equipment first cost
- Useful life:
  - 15 years
- Effective tax rate:
  - 25% annually
- Minimum Attractive rate of return:
  - 12% per year
- Estimated inflation rate
  - 15% for the first five years and 10% thereafter

A: sum of the digits of your student no. * 100 Million Toman (MT)
B: sum of the five digits (from the right) of your student no. * 75 MT
C: sum of the three digits (from the right) of your student no. * 50 MT

a) Calculate depreciation charges and book values of the production equipment during its useful life using SL, SYD, and DDB methods. Using Excel, draw a chart which shows the variation of book values of these three methods in one chart.

b) Calculate CFBT considering inflated cash flows. Then calculate PW of CFBT using market rate (inflation-adjusted MARR).

c) Calculate CFAT considering inflated cash flows which is called CFAT*. Then calculate PW of CFAT* using market rate with the three above-mentioned depreciation methods.
For CFAT calculation, don't need to inflate the depreciation amounts.

d) Using Excel, draw a chart which shows CFBT, $CFAT_{SL}$, $CFAT_{SYD}$, and $CFAT_{DDB}$ during the useful life in one chart where the subscripts of SL, SYD, and DDB are depreciation methods which are used to calculate CFAT series.

e) Using Data Tables in Excel, produce a single chart which shows variation of PWs of CFAT versus the amount of third year operating revenue, first year human resources cost, useful life, MARR, and salvage value in the range of -50% to +50% of their values. Use SL depreciation for CFAT calculation.

f) Calculate rate of return (ROR) of the project using $CFAT_{SL}$ series. Then using Data Tables, produce a single chart which shows variation of ROR versus the amount of third year operating revenue, first year material cost and useful life in the range of -50% to +50% of their values.

g) Assume that annual operating revenue is determined based on the number of manufactured products during a year. Consider the following information. Selling price is 100 Thousand Toman (TT) per unit and the number of manufactured products will be increased 10% annually. Human resource, material, and overhead & other costs are 50 TT, 40 TT, and 30 TT per unit, respectively. Other required information is the same as the problem statement. Determine the breakeven point of this project so that PW of $CFAT_{SL}$ is equal to zero.

Please use Microsoft Excel for doing this assignment, and everybody must submit **his/her own solution** as a single Excel file with multiple worksheets **no later than Dey 18 , 1398 only through LMS**.
Sending the assignment to my email is not acceptable.

Good luck!
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Dey 03, 1398