**IENG112**

**Notes #11**

**Engineering Economy**

**1. Time Diagram of Investments:** Shows the net cash in-flow/out-flow.

* **Salvage value:** The value of the equipment at the end of its use.
* **Costs in time diagram:** 1. Investment, 2. Yearly installment, 3. Operation, 4. Maintenance.

**2. Net Present Value:** What is the value of a sum S if it is obtained n years from now on and the inflation rate is *i*?

The underlying equation is

The factor is called **single-payment compound amount factor.**

**3. Examples for Interest Factors**

Pages 341 and 342. In all examples the interest rate is 12 percent.

**3.1. The value of an investment after n years**

*I* = the invested amount

*F =* future value

**3.2. What is the sum which will have value F after n years?** (2)

=

**3.3. What is the total value at the end of n years if at the end of each year *I* is invested?** (3)

The value of the investment of the first year:

The value of the investment of the second year:

. . .

The value of the investment of the last year:

Total value

**3.4. What is the yearly installment of loan if it is paid back in n years?** (4)

*L* = loan

*y* = yearly installment

The still unpaid loan at the end of the first year:

The still unpaid loan at the end of the second year:

. . .

The still unpaid loan at the end of the last year:

*y* = 265.5.

***The formula for the unpaid loan (remaining debt) is true even in the case if you pay the same nominal installment in every year for a while.***

**3.5. How much should be saved at the end of each year of a period of n years if the future value is *F*?** (5)

The saved value at the end of the first year: *y*.

The saved value at the end of the first year: *y*(1+*i*)+*y* = *y*(2+*i*).

. . .

The saved value at the end of the last year:

**3.6. How much is the loan if the yearly installment is y in a period of n years?** (6)

Exactly the same equations as in 3.4, however the unknown is *L* and not *y*.

y=100

n=5

**4. Comparison of investment options**

n=5

**Alternative 1.** No investment, yearly *nominal* cost is 10,000 USD.

*Nominal value* is the value which is not adjusted according to the inflation.

**Alternative 2.** 30,000 USD investment and yearly nominal cost 2000 USD. No salvage value.

**Alternative 3.** 40,000 USD investment and yearly nominal cost 1000 USD. The salvage value at the end of year 5 is 8000 USD.

**Net Present Values of the alternatives.**

**Alternative 1.**

**Alternative 2.**

**Alternative 3.**

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Useful exercises

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What is per cent? \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

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**Supplement to Notes #11**

**Engineering Economy**

1. **Inflation.** The change of the price of the basket from on year to the next one expressed in a multiplicative way
2. **Total inflation from year *n* to year *m*** (*n < m*)
3. **Net present value of a past sum:**