

University of Diyala

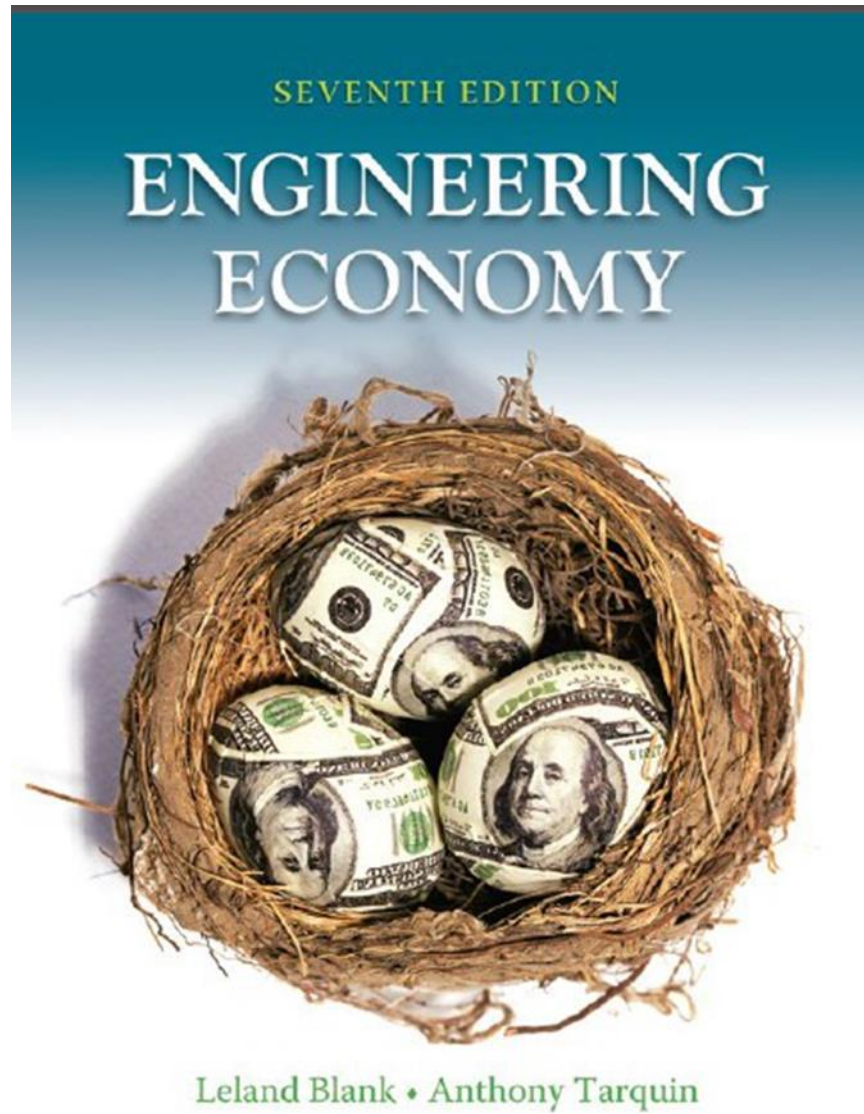
# **Engineering Economy**

## **Lecture 3**

3<sup>rd</sup> Stage

Communication department / Engineering collage

Lecturer Marwa Mohammed



# Chapter 1

## Foundation of Engineering Economy

# Rate of return

- Interest earned over a specific period of time is expressed as a percentage of the original amount (principal) and is called rate of return (ROR).

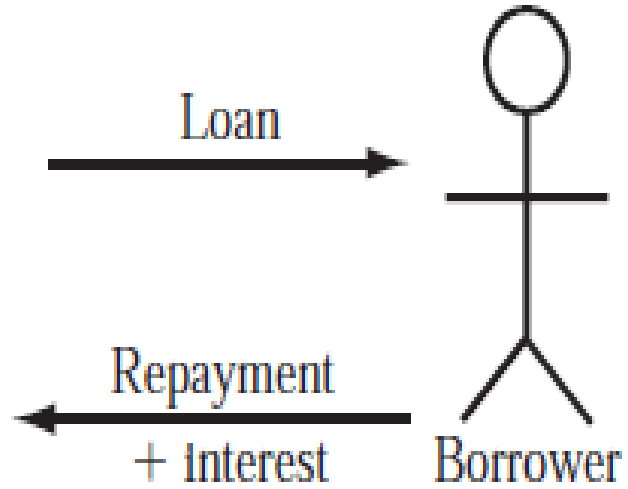
- Rate of return (%) =  $\frac{\text{interest accrued per time unit}}{\text{principal}} * 100\%$  [2]

❖ Borrower's perspective – interest rate paid

❖ Lender's or investor's perspective – rate of return earned

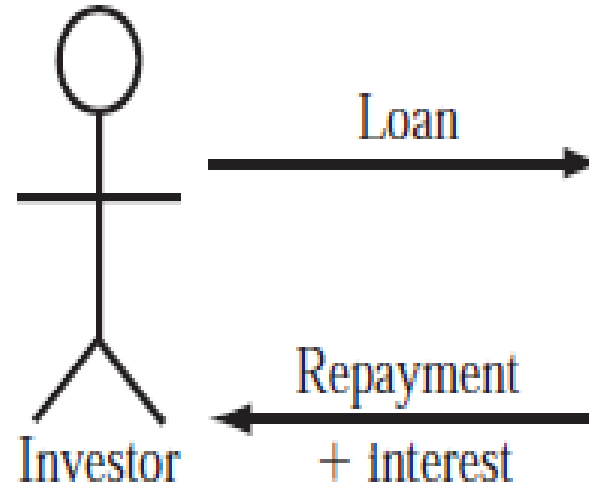


**Bank**



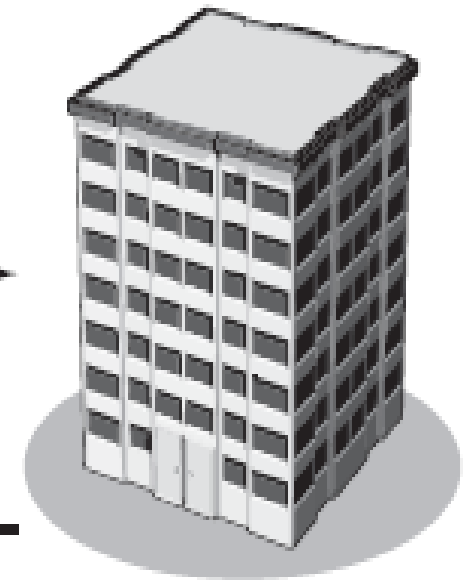
(a)

Interest rate



(b)

Rate of return



**Corporation**

# Terminology and Symbols

- $P$  value or amount of money at a time designated as the present or time 0.
- $F$  value or amount of money at some future time. Such as at  **$t=n$**  periods in the future.
- $n$  number of interest periods; years, months, days
- $i$  interest rate per time period; percent per year, percent per month
- $t$  time, stated in periods; years, months, days

### Example 3:

Today, Julie borrowed \$5000 to purchase furniture for her new house. She can repay the loan in either of the two ways described below. Determine the engineering economy symbols and their value for each option.

(a) Five equal annual instalments with interest based on 5% per year.

(b) One payment 3 years from now with interest based on 7% per year.

### Solution

(a) The repayment schedule requires an equivalent annual amount  $A$ , which is unknown.

$P = \$5000$      $i = 5\%$  per year     $n = 5$  years     $A = ?$

(b) Repayment requires a single future amount  $F$ , which is unknown.

$P = \$5000$      $i = 7\%$  per year     $n = 3$  years     $F = ?$

#### Example 4:

Last year Jane's grandmother offered to put enough money into a savings account to generate \$5000 in interest this year to help pay Jane's expenses at college. (a) Identify the symbols, and (b) calculate the amount that had to be deposited exactly 1 year ago to earn \$5000 in interest now, if the rate of return is 6% per year.

#### Solution

a) Symbols  $P$  (last year is -1) and  $F$  (this year) are needed.

$$P = ?$$

$$i = 6\% \text{ per year}$$

$$n = 1 \text{ year}$$

$$F = P + \text{interest} = ? + \$5000$$

b) Let  $F$  = total amount now and  $P$  = original amount. We know that  $F - P = \$5000$  is accrued interest. Now we can determine  $P$ .

$$F = P + Pi$$

The \$5000 interest can be expressed as

$$\begin{aligned} \text{Interest} &= F - P = (P + Pi) - P \\ &= Pi \end{aligned}$$

$$\$5000 = P(0.06)$$

$$P = \$5000/0.06 = \$83,333.33$$