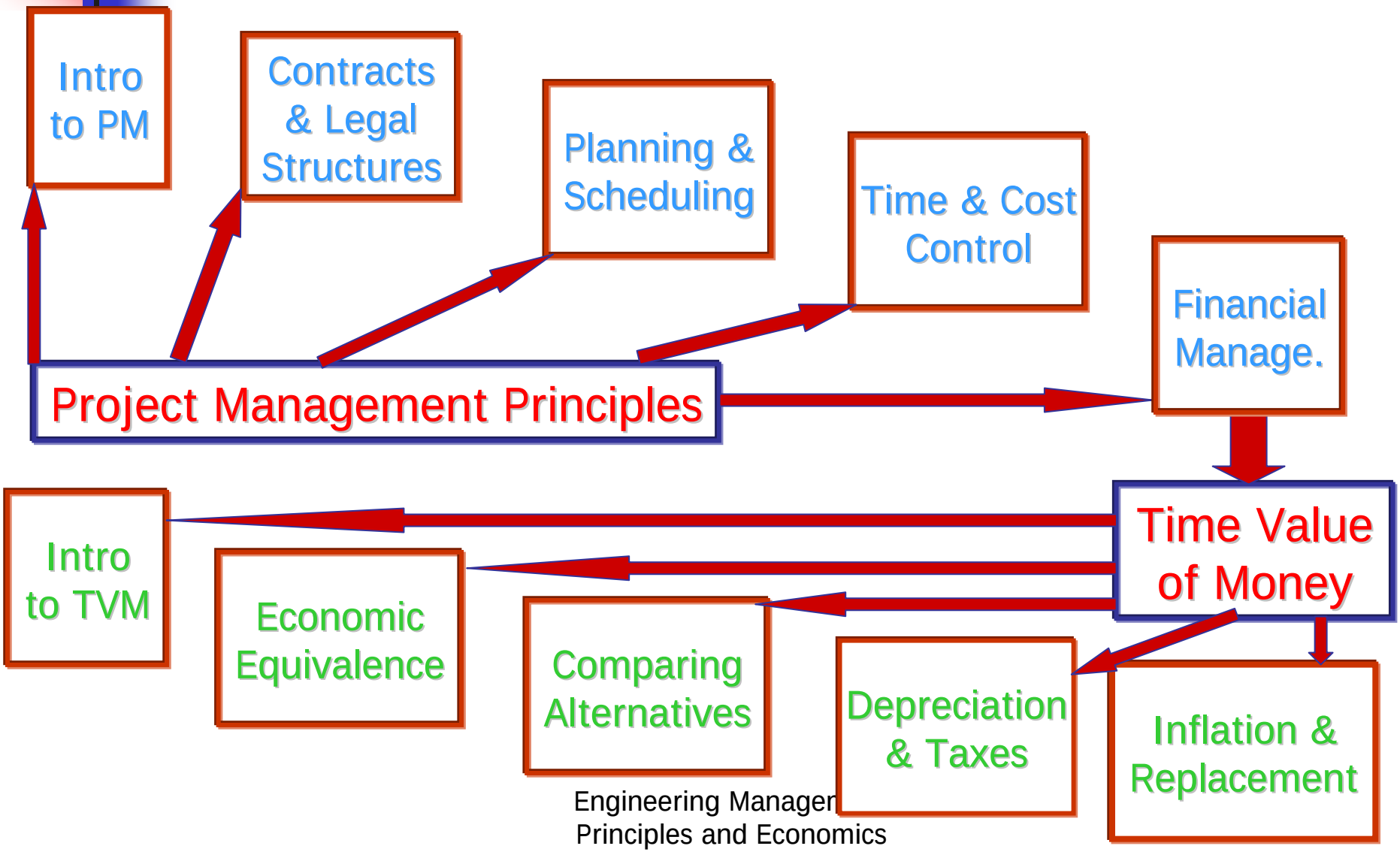
ENGR 301: COURSE OUTLINES



QUIZ !!!

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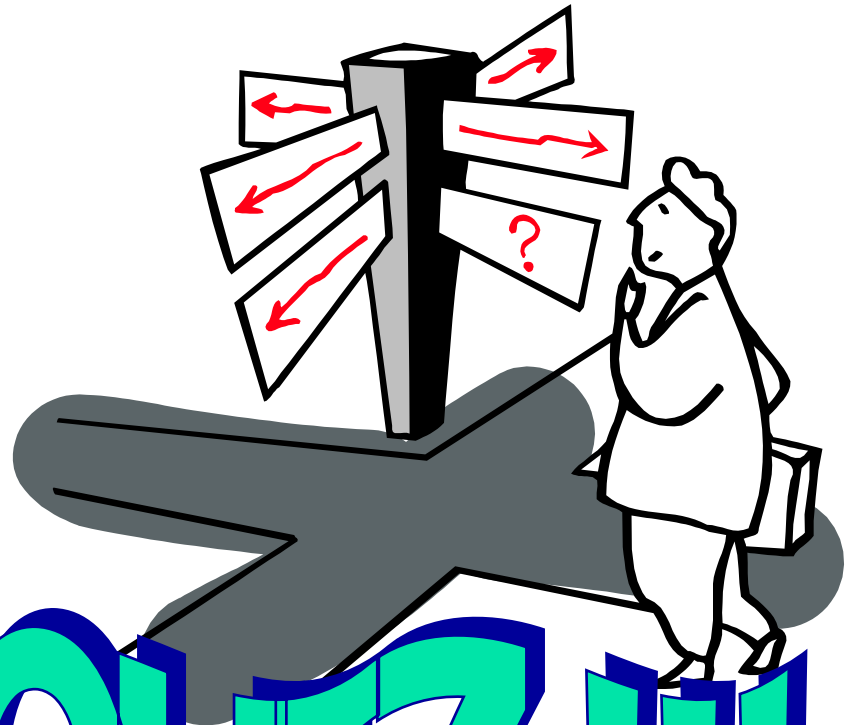


ETHICS and PROFESSIONALISM

- Quiz:
  - What is a project?
  - What is Project Management (PM)?
  - What are the PM knowledge areas?
  - What are the different types of organizational structure frame?
  - To execute a project, different parties have to participate. There has to be some kind of contractual relationship among them. What are the various types of contracts? Their characteristics?

ETHICS and PROFESSIONALISM

- Quiz:
  - Each organization should have legal and management structures. List them and briefly describe each considering their advantages and disadvantages?
  - What is time management? How? Planning and scheduling! How?
  - Often we hear the expression: time & cost control! Describe? Comment?

ETHICS and PROFESSIONALISM

- Quiz:
  - Is economic analysis study important particularly to engineers? Explain?
  - What is
    - Present value (PV)?
    - Final value (FV)?
    - Annual value (AV)?
    - Present worth (PW)? Annual worth (AW)?
    - Minimum attractive rate of return (MARR)? Internal rate of return (IRR)?

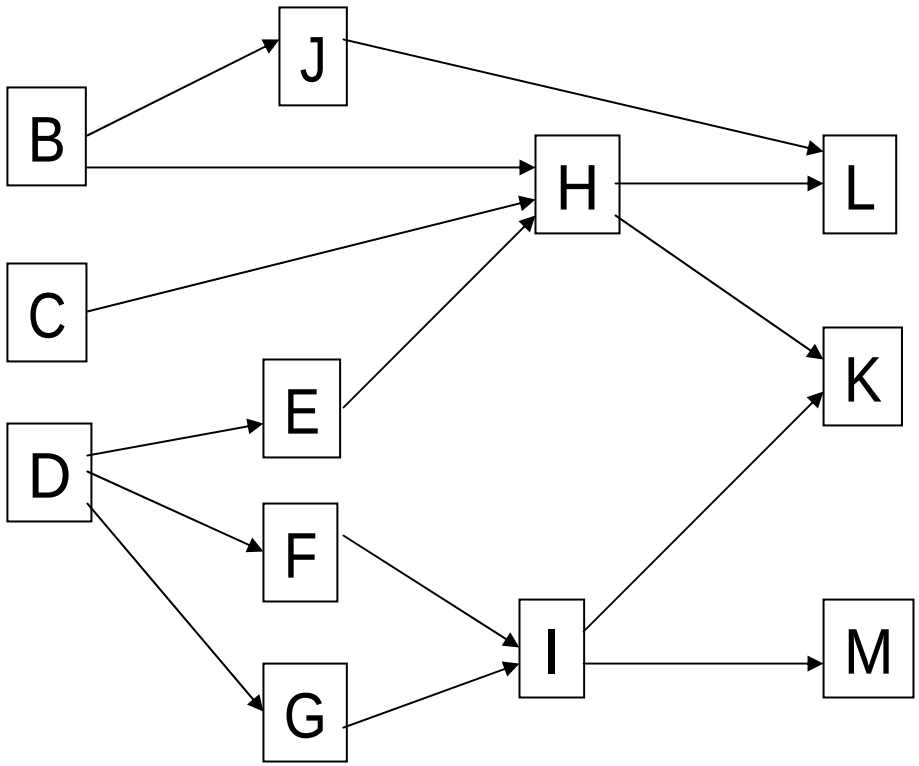
ETHICS and PROFESSIONALISM

- Quiz:
  - What is
    - depreciation? How?
    - inflation? How?
    - tax? How?

EXAMPLE # 1

Activity	Precedes	Duration (Days)
B	H,J	25
F	I	5
G	I	10
C	H	18
D	E,F,G	22
K	---	14
L	---	25
E	H	2
H	L,K	8
I	K,M	10
J	L	14
M	---	22

EXAMPLE # 1: PRECEDENCE (AON)



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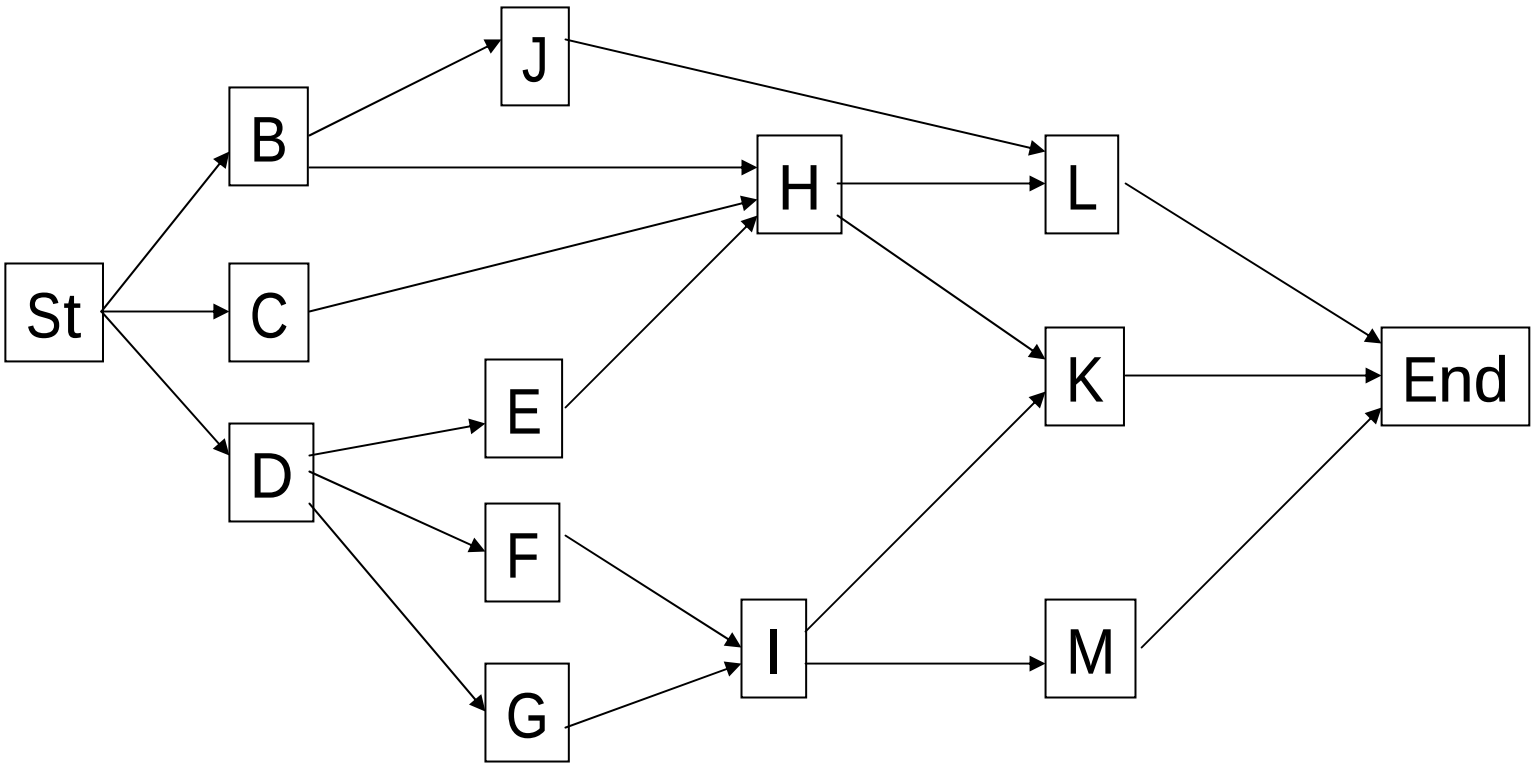

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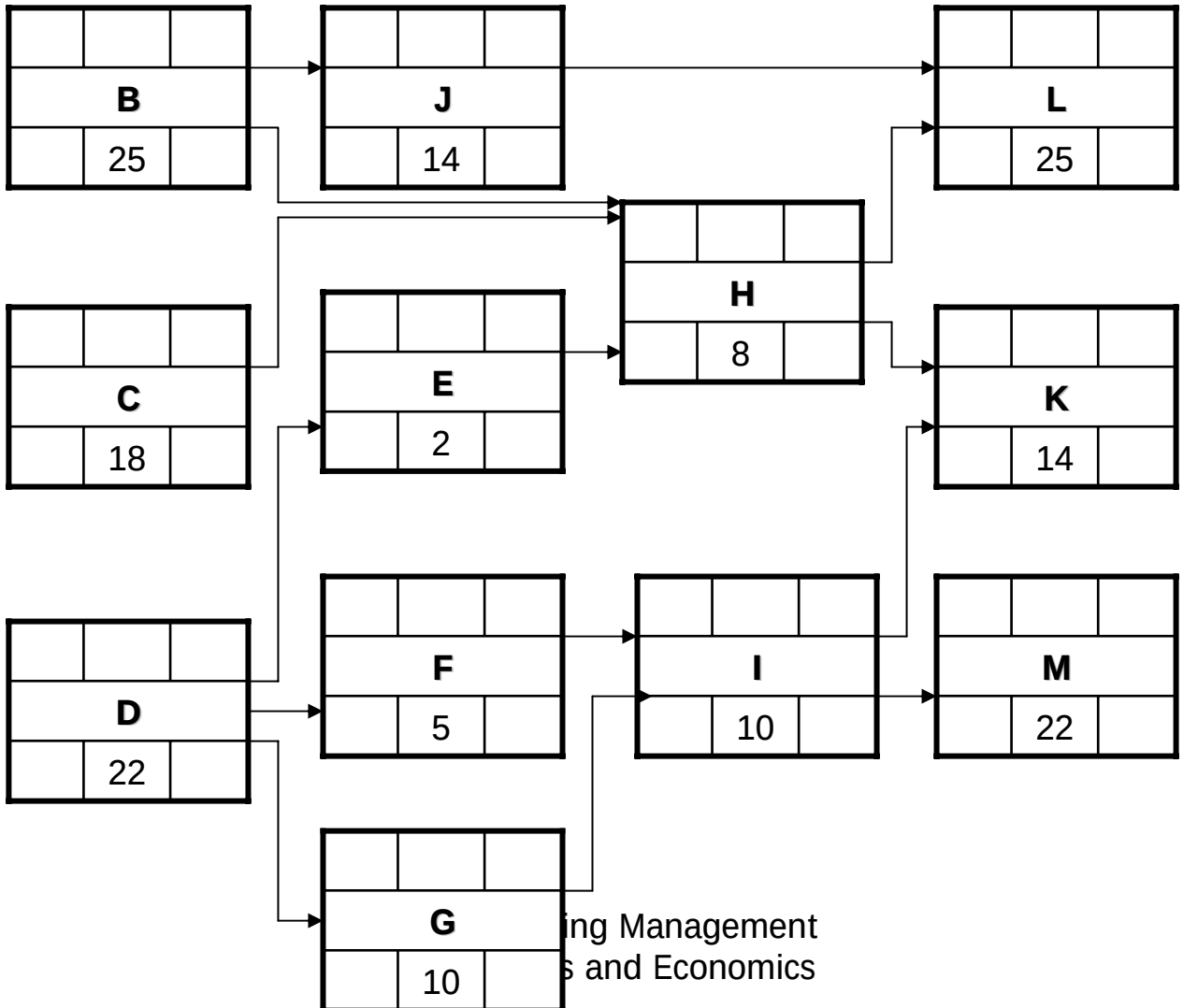

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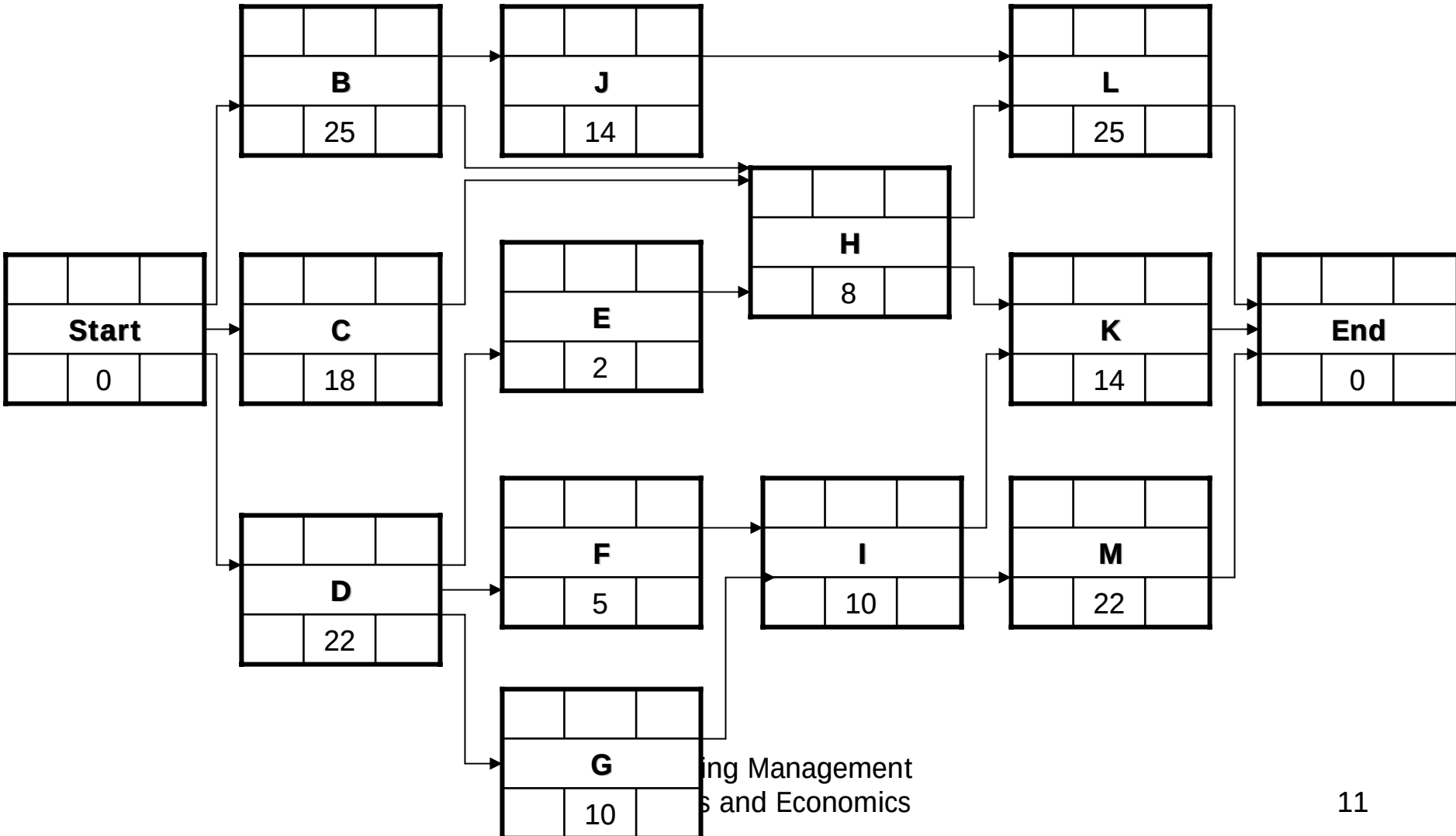
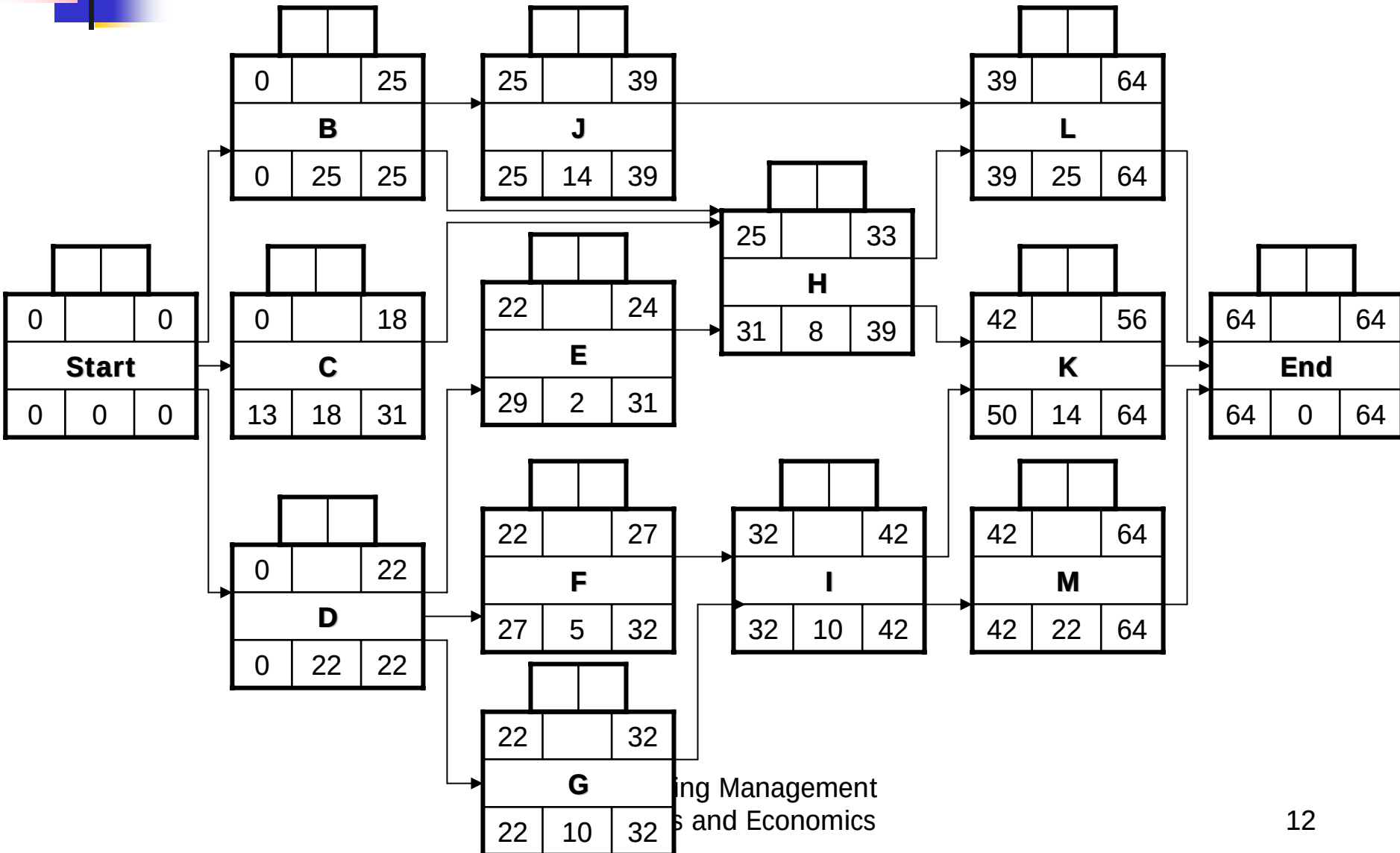


EXAMPLE # 3: PRECEDENCE (AON) "Backward Pass Calculation"



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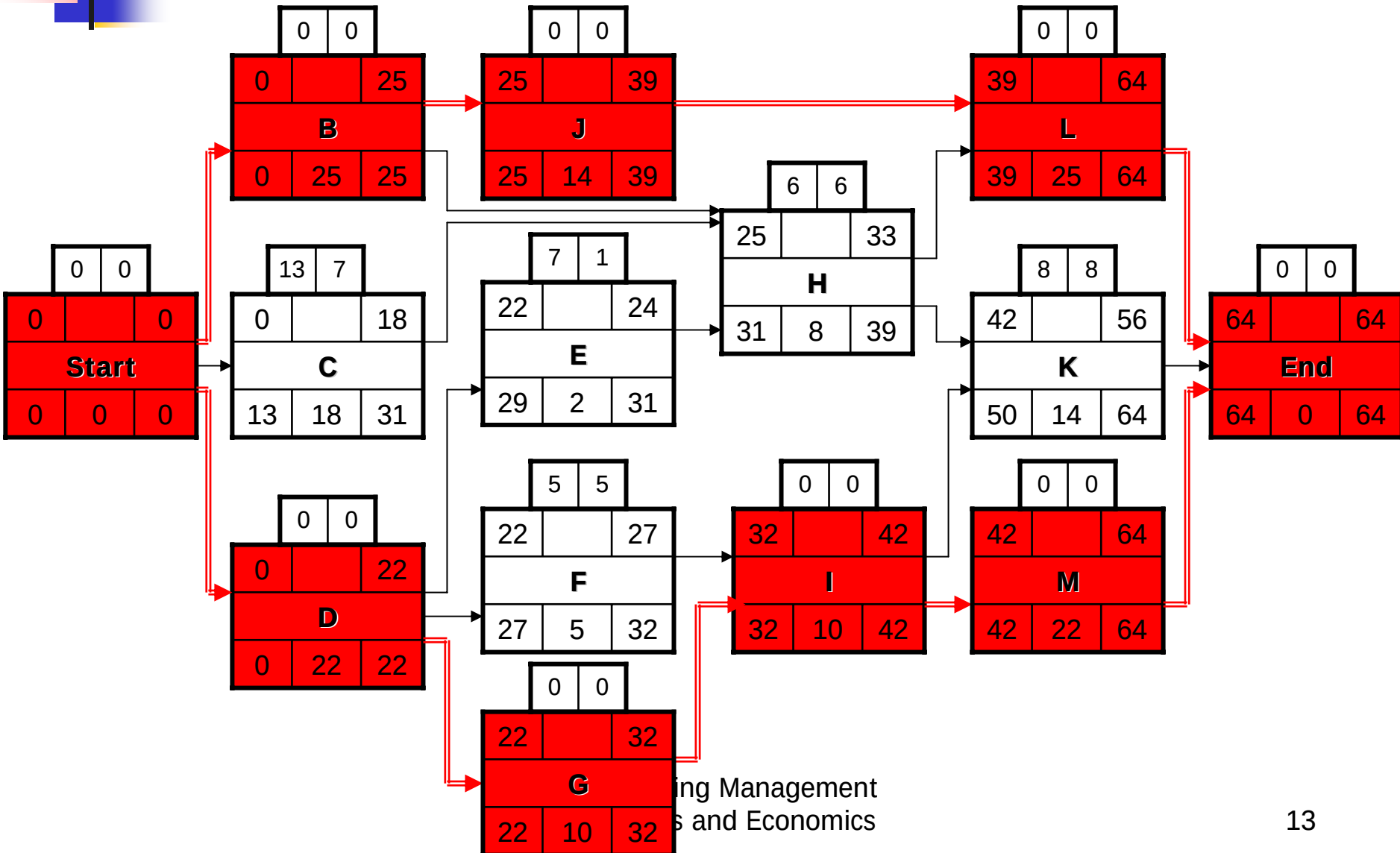


PROGRESS INDICES

ACWP = Actual Cost of Work Performed

BCWP = Budgeted Cost of Work Performed

BCWS = Budgeted Cost of Work Scheduled

SV = Schedule Variance = BCWP - BCWS

CV = Cost Variance = BCWP - ACWP

PROGRESS INDICES

Control Indices:

$$\textbf{Cost Index} = \frac{ACWP}{BCWP} \quad \begin{array}{l} > 1 \text{ Loss} \\ < 1 \text{ Save} \end{array}$$

$$\textbf{Time Index} = \frac{BCWS}{BCWP} \quad \begin{array}{l} > 1 \text{ Delay} \\ < 1 \text{ Save} \end{array}$$

PROGRESS INDICES

Control Indices:

$$\textbf{Project Cost Pred.} = \frac{ACWP}{BCWP} * TPC$$

$$\textbf{Project Time Pred.} = \frac{BCWS}{BCWP} * TPT$$

TPC = Total Project Cost
TPT = Total Project Time

EXAMPLE

- In a building construction project, the up-to-date report at the 6th month indicates that:

  BCWS = $54,560.00

  BCWP = $42,060.00

  ACWP = $44,130.00

  The total project duration is 36 months and the estimated project cost is $2,000,000.

- It is required to assess the project situation to-date and project this assessment to the end of the project from time and cost perspectives.

EXAMPLE: SOLUTION

$$\textbf{Cost Index} = \frac{\$44{,}130.00}{\$42{,}060.00} = 1.05 > 1 \text{ Loss}$$

$$\textbf{Time Index} = \frac{\$54{,}560.00}{\$42{,}060.00} = 1.30 > 1 \text{ Delay}$$

EXAMPLE: SOLUTION

Project Cost Pred. = 1.05 * $2,000,000

= $2,100,000

Project Time Pred. = 1.30 * 36 =

= 46.80 months

GRADIENT SERIES AS A COMPOSITE SERIES

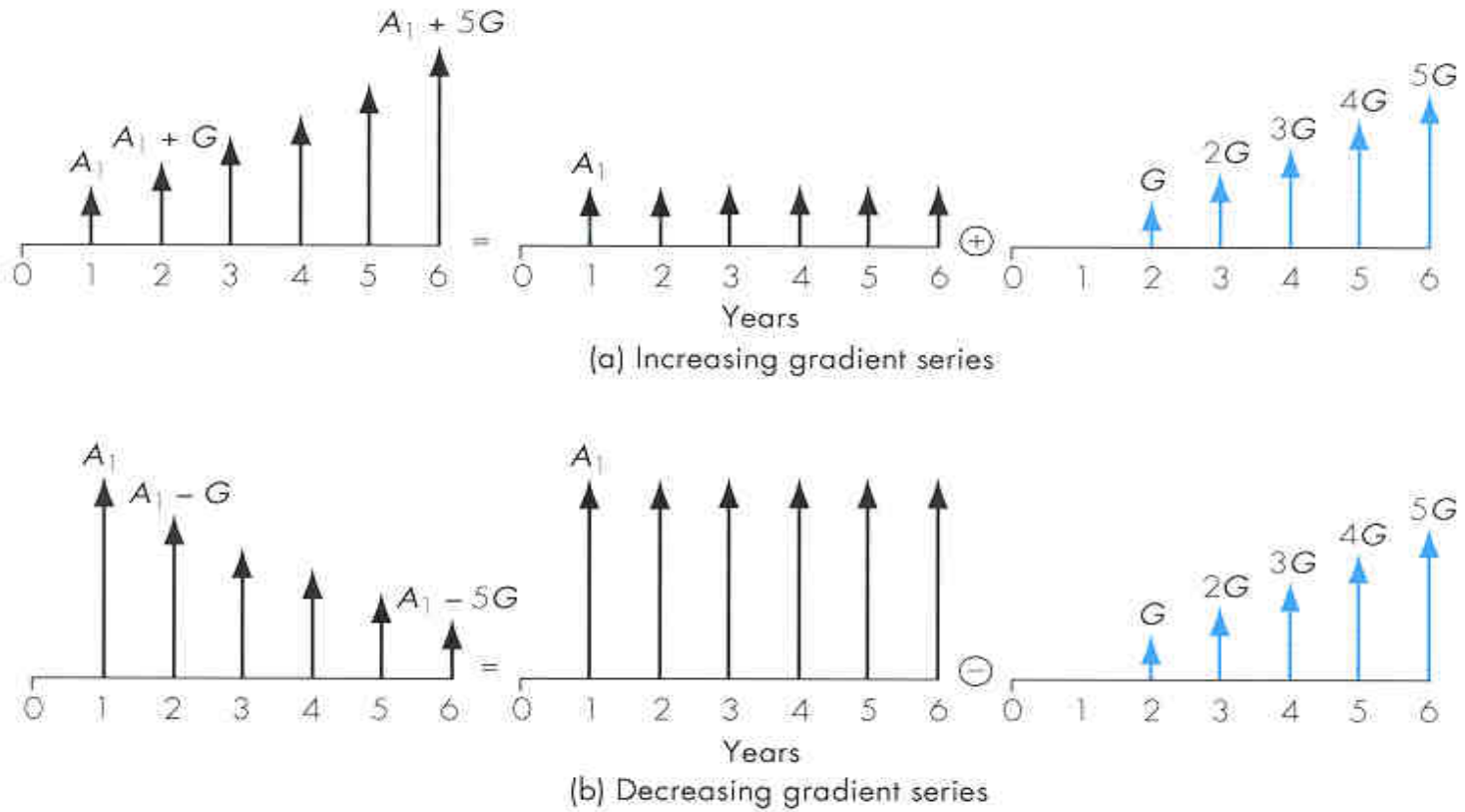


Figure 4.27 Two types of linear gradient series as composites of a uniform series of N payments of A_1 and the gradient series of increments of constant amount G

METHOD 1:

Compute the present worth of the cash flows shown in the cash flow table below. Interest rate = 9%

Year	0	1	2	3	4	5
Cash Flow	-$10,000	1,000	2,000	3,000	4,000	5,000

Solution:

A = $1,000/yr and G= $1,000/yr.

NPW= PW of benefits - PW of costs

$=1{,}000\times(P/A,9\%,5)+1{,}000\times(P/G,9\%,5)-10{,}000$

$=1{,}000\times3.890+1{,}000\times7.111-10{,}000 = \$1001$

EFFECTIVE ANNUAL INTEREST RATE

- If Cash flow occurs similar to interest compounding duration: (i.e. monthly each, quarterly each, etc.)

$$i_a = (1 + r / M)^M - 1$$

r = nominal interest rate / yr

i_a = effective annual interest rate

M = number of interest periods / yr

Case I: When Payment Periods and Compounding periods coincide

Step 1: Identify the number of compounding periods (M) per year

Step 2: Compute the effective interest rate per payment period (i)

$$i = r/M$$

Step 3: Determine the total number of payment periods (N)

$$N = M \text{ (number of years)}$$

Step 4: Use the appropriate interest formula using i and N above

Example

A department store offers 24 month financing for a certain $1,000 appliance at an "interest rate of 9% per year". The 24 equal end-of-month payments are computed as follows.

Principal	$1,000.00
Interest at 9% per year = 0.09×1,000×2=	180.00
Credit investigation fee	18.08
Total to be repaid	$1,198.08
Monthly payments $1,198.08 / 24 =	$49.92

(a) What is the effective annual interest rate a customer would actually pay for this financing

(b) What is the nominal annual interest rate compounded monthly for this financing?

Example

Solution

(a) $49.92 = 1{,}018 \times (A/P, i, 24)$.

Then, $(A/P, i, 24) = 0.04904$.

From interest tables, monthly interest rate (i) = 1.33%.

Effective annual interest rate (i_a) = $(1.013)^{12} - 1$ = $(F/P, 1.33\%, 12) - 1 = 16.77\%$.

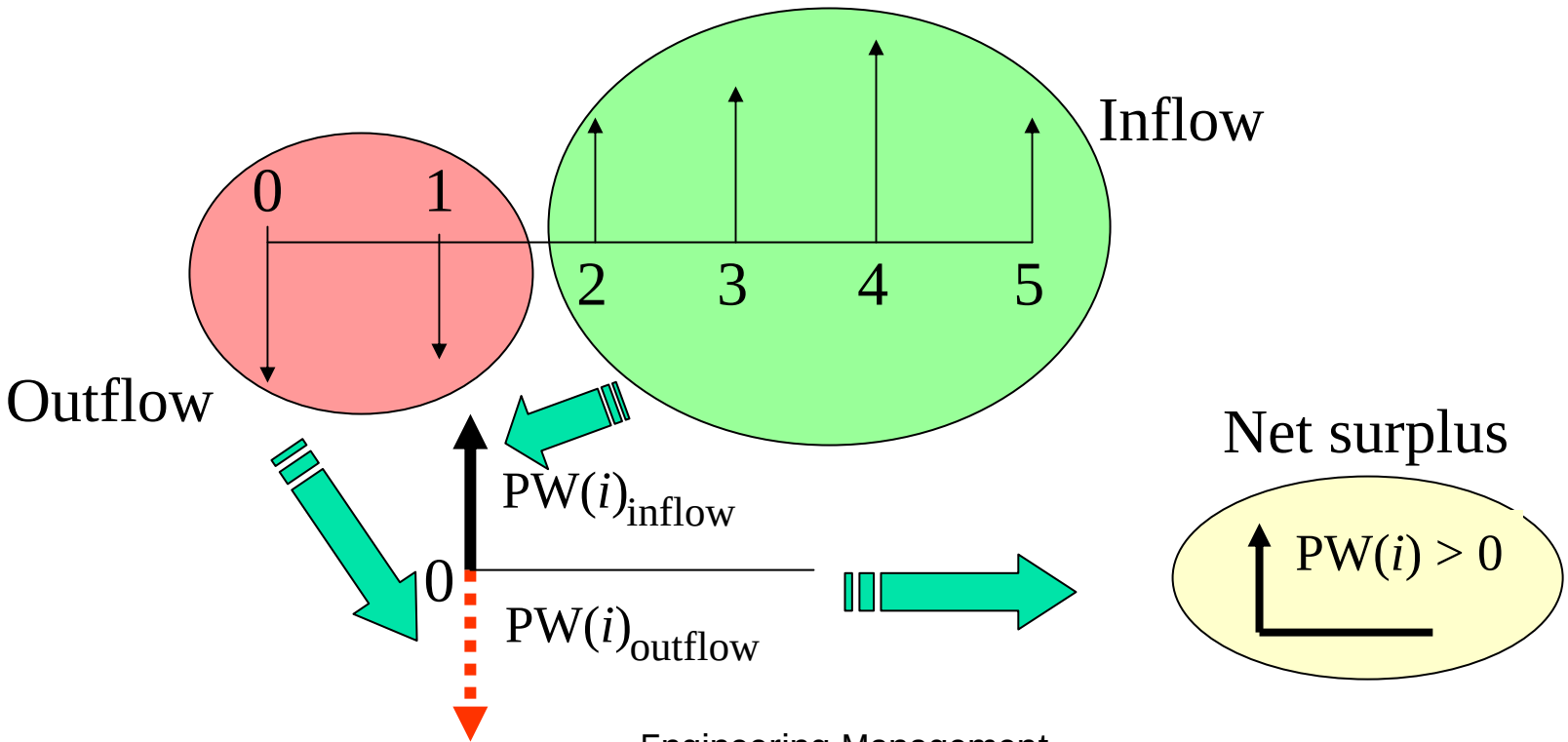
(b) Nominal annual interest rate, compounded monthly,

$r = 1.33\% \times 12 = 16\%$.

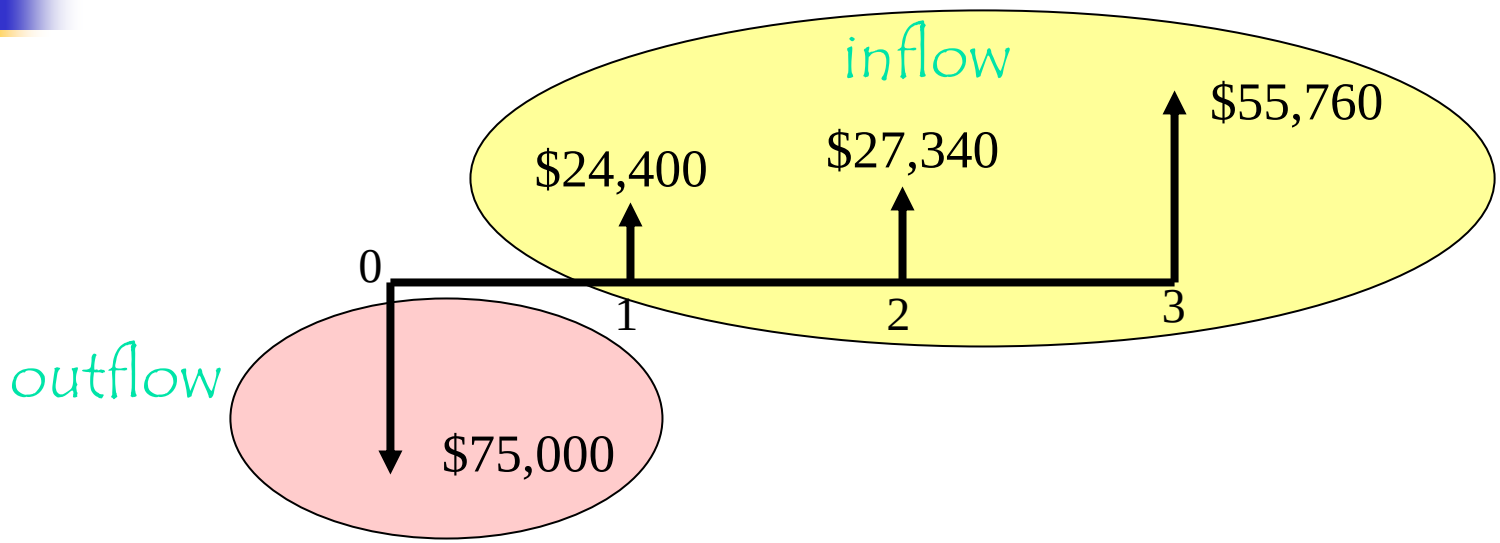
NET PRESENT WORTH MEASURE

Principle: Compute the equivalent net surplus at $n = 0$ for a given interest rate of i.

Decision Rule: Accept the project if the net surplus is positive.



EXAMPLE: TIGER MACHINE TOOL COMPANY



$$PW(15\%)_{\text{inflow}} = \$24{,}400(P/F,15\%,1) + \$27{,}340(P/F,15\%,2) + \$55{,}760(P/F,15\%,3)$$

$$= \$78{,}553$$

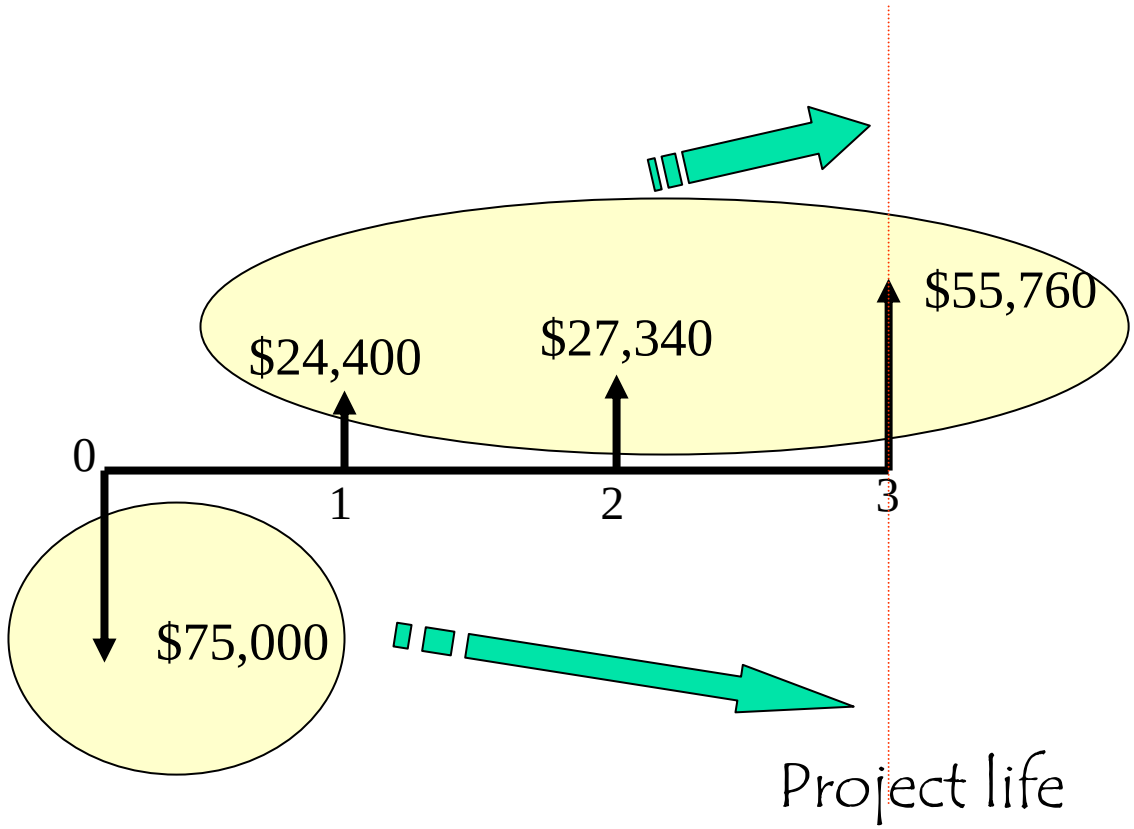
$$PW(15\%)_{\text{outflow}} = \$75{,}000$$

$$PW(15\%) = \$78{,}553 - \$75{,}000$$

$$= \$3{,}553 > 0, \text{ Accept}$$

FUTURE WORTH CRITERION

- Given: Cash flows and MARR (*i*)
- Find: The net equivalent worth at the end of project life



Future Worth Criterion

$$FW(15\%)_{\text{inflow}} = \$24{,}400(F/P,15\%,2) + \$27{,}340(F/P,15\%,1)$$
$$+\$55{,}760(F/P,15\%,0)$$
$$= \boxed{\$119{,}470}$$

$$FW(15\%)_{\text{outflow}} = \$75{,}000(F/P,15\%,3)$$
$$= \boxed{\$114{,}066}$$

$$FW(15\%) = \$119{,}470 - \$114{,}066$$
$$= \boxed{\$5{,}404 > 0,\ \text{Accept}}$$

Internal Rate of Return Lenders Viewpoint

- The interest rate paid on the unpaid balance of a loan such that the payment schedule makes the unpaid loan balance equal to zero when the final payment is made.

Year	Plan A	Plan B	Plan C	Plan D
0	$(5,000.00)	$(5,000.00)	$(5,000.00)	$(5,000.00)
1	$ 1,400.00	$ 400.00	$ 1,252.28	$ -
2	$ 1,320.00	$ 400.00	$ 1,252.28	$ -
3	$ 1,240.00	$ 400.00	$ 1,252.28	$ -
4	$ 1,160.00	$ 400.00	$ 1,252.28	$ -
5	$ 1,080.00	$ 5,400.00	$ 1,252.28	$ 7,346.64
IRR	8.00%	8.00%	8.00%	8.00%

Calculating IRR

- PWB/PWC = 1
- 1,252.28(P/A,i,5)/5,000 = 1
- (P/A,i,5) = 5,000/1,252.28 = 3.9927

Example 7-1

From Compound Interest Tables

Interest rate	(P/A,i,5)
7%	4.100
8%	3.993
9%	3.890

LEARNING OBJECTIVES

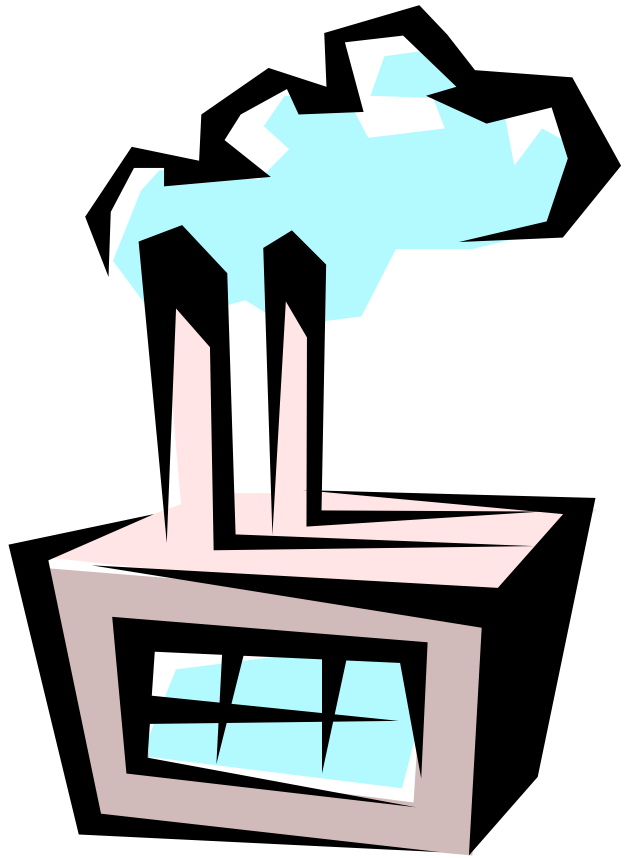
- Define depreciation and book value?
- Depreciation methods:

(1) Straight Line (SL) method,

(2) Double Declining (DD) method,

(3) Sum of the Years digits (SOY),

(4) Production method,



STRAIGHT LINE METHOD

- Suppose that:

  Purchase price = P

  Salvage value = S

  Service life = N
- Then, the depreciable amount = P – S
- Depreciation rate (R) = **1 / N**
- Then, depreciation amount = **(P - S) / N**
- Book value (BV) at m # of years =

  P - m * [(P - S) / N]

DOUBLE-DECLINING BALANCE METHOD

- If this method is applied to new equipment of 3 years service life, the depreciation of this method is approximately as twice as Straight Line (SL) method. Therefore, it is called Double-Declining Balance (DDB).
- Depreciation rate (R) = 2.00/N (new)

  R = 1.50/N (used)
- Depreciation amount =

  R * BV (at the previous year)

SUM-OF-THE-YEARS (SOY) METHOD

- It is an accelerated method (fast write-off). It is faster in depreciation rates than straight line method.
- **SOY** = 1+2+3+4+.....+N = **N(N+1)/2**
- Depreciation rate at year m is

  $R_m = (N-m+1)/SOY$
- Depreciation yearly amount is

  $D_m = R_m(P-S) = (N-m+1)(P-S)/SOY$
- **BV_m** at the end of year m **=**

  $= P - \{[m(N-(m/2)+0.5)](P-S)/SOY\}$

QUESTION OF THE COURSE?

I hope that you enjoyed ENGR 301 and get some benefits out of it.