ENGINEERING ECONOMICS AND FINANCIAL MANAGEMENT (HUM 3151)

Discrete Compounding Formulas with Discrete Payments:

Single Payment Series	Compound Amount, *(F/P, i, n)*	$F = P(1+i)^n$
	Present Worth, *(P/F, i, n)*	$P = F(1+i)^{-n}$
Equal Payment Series	Compound Amount, *(F/A, i, n)*	$F = A\left[\frac{(1+i)^n - 1}{i}\right]$
	Sinking Fund, *(A/F, i, n)*	$A = F\left[\frac{i}{(1+i)^n - 1}\right]$
	Present Worth, *(P/A, i, n)*	$P = A\left[\frac{(1+i)^n - 1}{i(1+i)^n}\right]$
	Capital Recovery, *(A/P, i, n)*	$A = P\left[\frac{i(1+i)^n}{(1+i)^n - 1}\right]$
Gradient Series	Conversion factor, *(A/G, i, n)*	$A = G\left[\frac{(1+i)^n - in - 1}{i(1+i)^n - i}\right]$

Nominal and Effective Interest Rates:

Effective interest rate per period $i = \frac{r}{m}$	m = Number of compounding periods per year r = Interest rate
Effective annual interest rate $i_{eff} = (1 + \frac{r}{m})^c$ - 1	m = Number of compounding periods per year c = Number of compounding period per payment period r = Interest rate
Capitalized Cost (CC) $CC = \frac{A}{I}$	A = Annual worth I = interest rate

Capital Recovery (CR) $CR = (I - S) \times \left(\frac{A}{P}, i, n\right) + S * i$	I = Purchase price of the machine S = Salvage value of the machine at the end of machine life n = Life of the machine in years, and i = Interest rate, compounded annually
Economic Life of an Asset	Capital Recovery expenses + EUAC of operating and maintenance expenses

Depreciation	
i. Straight Line Depreciation Annual Depreciation = $D_n = \frac{Purchase\ Price - Salvage\ Value}{Years\ of\ useful\ life}$ Book Value = $I - (n * D_n)$	D_n = Annual depreciation amount I = Purchase price of the equipment n = Number of Years
ii. Decline Balance Method (DBM) Depreciation The depreciation rate (α) is given by $\propto = 1 - \left(\frac{B_n}{I}\right)^{\frac{1}{n}}$ The depreciation charge for any year 'n' is given by, $D_n = \alpha I(1 - \alpha)^{n-1}.$ The book value is given by, $B_n = I(1 - \alpha)^n.$	$\propto$ = Annual rate of Depreciation (%) B_n = Book value of the equipment I = Purchase price of the equipment n = Number of Years D_n = Depreciation charge for any year "n".
iii. **Double Decline Balance Depreciation** Annual rate of depreciation is, $\propto$ = 2 / years of useful life or $\propto = \frac{2}{n}$	$\propto$ = Annual rate of Depreciation (%) n = Number of Years

Ratio Analysis

Types of Financial Ratios

I. Liquidity Ratios

Current Ratio

Current Ratio= Current assets/current liabilities

Acid test ratio (quick ratio)

Acid test ratio (quick ratio) = (current assets – inventories)/ liabilities

II. Financial Leverage Ratio

Structural Ratio

Debt to equity ratios

Debt to equity ratios = total debt or long term debt/shareholder's equity

Debt to total asset

Debt to total asset = total debt/ total asset

Coverage ratio

Interest coverage ratio

Interest coverage ratio = Earnings before Interest & Taxes/ Interest Expense

III. Turnover Ratios

1. Inventory turnover

Inventory turnover = Cost of goods sold /Average inventory

Costs of goods sold = Opening stock + Manufacturing cost including purchases –

Closing stock

Or cost of goods sold= (100- %gross profit) sales

Avg. Inventory = Avg. of monthly inventory for calendar year considered

= (opening stock + closing stock)/2

In the absence of data, inventory turnover = Sales/ Closing Inventory

2. Debtor's turnover ratio

Debtors turnover = Net Credit sales/ (Avg. accounts receivable (or avg. debtors)

Average debtors= (opening balance debtors + closing balance debtors)/ 2

Closing balance= Current assets – Inventories - Cash

In the absence of data, Debtors turnover = Total sales/ (debtors + bills receivable)

Average collection period

Another method of measuring liquidity of firm's debtors is **average collection period.**

Avg. accounts receivable/avg. daily credit sales

OR (Avg. debtor's /credit sales) x 360 days

SIMILARLY, THERE IS CREDITORS TURNOVER RATIO

3. Asset Turnover

Fixed Asset Turnover = costs of goods sold/ avg. fixed assets

Total Asset Turnover = costs of goods sold/ avg. total assets

IV. Profitability Ratios

Profit margin ratio

- ⊡ Indication of relationship between profits and sales.

Two types,

1. Gross profit margin = (gross profit /sales) x100
2. Net profit margin
    a. Net profit margin (before tax) = (EBIT /Sales)
    b. Net profit margin (after tax) = EAT/ Sales

Return on Investment

- ■ Profits of firm to its investment

Return on Assets

Return on Assets = Net profit after tax/Avg. total assets

= (EAT + Interest - Tax Advantage on Interest)/ Assets

Return on equity

Return on equity = Net profit after tax/ avg. total shareholders' equity