Effective Interest Rate:

Consider that given interest rate in any question as annual nominal interest rate (r) if not mentioned anything else.

1. $Annual\ i_{eff} = \left(1 + \frac{r}{M}\right)^M - 1$

2. $Annual\ i_{eff\ (continuosly\ compounding\ )} = e^r - 1$

3. $Periodic\ i_{eff} = \left(1 + \frac{r\ periodic}{no.of\ compounding\ within\ per\ period}\right)^{no.\ of\ compounding\ within\ per\ period} - 1$

4. $Periodic\ i_{eff\ (continuosly\ compounding\ )} = e^{r}/_K - 1$

5. $i_{per\ period\ nominal} = \left(1 + i_{eff\ annual}\right)^{\frac{1}{No\ of\ period\ per\ year}} - 1$

Installment period is equal to interest compounding period: Convert r into per period i.e., $i_{periodic}$=r/m
Installment (q) is less frequent than compounding (m): Convert r into per period, use $Periodic\ i_{eff}$
Installment (m) is more frequent than interest compounding (q): Convert r into per period, use $i_{per\ period\ nominal}$

Formulas for Equivalence Calculation

Factor Name (To Find)	Given	Formula	Factor Notation
Single Payment			
Compound Amount (F)	Present Amount (P)	$F = P(1 + i)^N$	(F/P, i, N)
Present Amount (P)	Future Amount (F)	$P = F\left[\dfrac{1}{(1 + i)^N}\right]$	(P/F,i,N)
Equal Payment Series			
Compound Amount (F)	Annuity (A)	$F = A\left[\dfrac{(1 + i)^N - 1}{i}\right]$	(F/A, i,N)
Sinking Fund (A)	Future Amount (F)	$A = F\left[\dfrac{i}{(1 + i)^N - 1}\right]$	(A/F,i,N)
Present Amount (P)	Annuity (A)	$P = A\left[\dfrac{(1 + i)^N - 1}{i(1 + i)^N}\right]$	(P/A,i,N)
Capital Recovery Amount(A)	Present Amount (P)	$A = P\left[\dfrac{i(1 + i)^N}{(1 + i)^N - 1}\right]$	(A/P,i,N)
Future Amount (F)	Annuity Due (AD)	$F = A\left[\dfrac{(1 + i)^N - 1}{i}\right](1 + i)$	(F/AD,i,N)
Present Amount (P)	Annuity Due (AD)	$P = A\left[\dfrac{(1 + i)^N - 1}{i(1 + i)^N}\right](1 + i)$	P/AD,i,N)
Linear Gradient Series			
Present Amount (P)	Gradient	$P = G\left[\dfrac{(1 + i)^N - iN - 1}{i^2(1 + i)^N}\right]$	(P/G, i, N)
Future Amount (F)	Gradient	$F = G\left[\dfrac{(1 + i)^N - iN - 1}{i^2}\right]$	(F/G,i,N)
Conversion Factor (A)	Gradient	$A = G\left[\dfrac{(1 + i)^N - iN - 1}{i[(1 + i)^N - 1]}\right]$	(A/G, i, N)
Geometric Gradient Series			
Present Worth (P)	Geometric Gradient	$P = A_1\left[\dfrac{1 - (1 + g)^N(1 + i)^{-N}}{i - g}\right]$	(P/A₁, g, i, N)

		$P = A_1 \left[\dfrac{N}{1+i}\right] (if\ i = g)$	
Future Worth (F)	Geometric Gradient	$F = A_1 \left[\dfrac{1 - (1+g)^N (1+i)^{-N}}{i - g}\right] (1+i)^N$ $F = A_1 \left[\dfrac{N(1+i)^N}{1+i}\right] (if\ i = g)$	(F/A₁, g, i, N)

Payback method (Even cash flow)

$$Simple\ Payback\ period = \frac{Investment\ Required}{Net\ Annual\ cash\ inflow}$$

Payback method (Uneven cash flow)

$$Simple/\ Discounted\ Payback\ period$$
$$= Minimum\ year + \frac{Unrecovered\ cost\ at\ the\ end\ of\ the\ year}{Cash\ flow\ during\ the\ year}$$

Equivalent Worth (EW) =EV of cash inflow-EV of cash outflow

Present Worth (PW) = -I + AR (P/A, i, N) + SV (P/F, i, N)

Future Worth (FW) = -I (F/P, i, N) + AR (F/A, i, N) + SV

Annual Worth (AW) = -I (A/P, i, N) + AR + SV (A/F, i, N)

Capitalized Worth (CW) =A (P/A, i, infinity) = A/i

Internal rate of return (IRR): Set EW (PW/AW/FW) = 0
EW(i*) = EW Cash inflows – EW Cash outflow

Trial and Error Method: Linear interpolation to approximate IRR (i*):

$$IRR(i^*) = LI + \frac{(Amount\ at\ LI - Amount\ at\ IRR)}{Amount\ at\ LI - Amount\ at\ HI} * (HI - LI)$$

IRR: Directly through calculator and table (Use only to identify HI and LI of Trial and Error Method)
1. From calculator, enter following equation in calculator, include value of I, AR and SV and replace i by x: 0= -I+AR (P/A, x, N)+ SV(P/F, x, N). For example: Enter 0=-205+50((1+x)⁵ - 1)/(x(1+x)⁵)+0/(1+x)⁵ in calculator.
2. To find value of x, press Shift, CALC and =. For example, after entry of above data, and pressing Shift, CALC and = provides 7%. Thus, IRR is 7%.
3. From Table: Calculate fake PVIFA by using= I/Average Annual Cash Flow Or PVIFA=I/(SV/N+AR); Find this PVIFA in table on given N's row and try for atleast 2 digit higher and lower interest rate using trial error method. For example: 205/50=4.1: see nearest value on PVIFA, at 6th year you will get it on 7%, then try at 5% and 9% to calculate actual IRR.

Investment balance table (Unrecovered Investment Balance Table):

EOY (A)	Cash Flow (B)	Unrecovered Cash flow (Beginning) (C)	Interest Factor @ ….% (D)	Unrecovered Cash flow (End of the year) (E)	Unrecovered Investment (E-B)

Modified Internal Rate of Return (MIRR)/External Rate of Return (ERR)

$$PV\ of\ cash\ outflows\ @\ MARR(1 + MIRR)^N = FV\ of\ Cash\ inflows\ @\ Reinvestment\ rate$$

Or,

$$MIRR = \sqrt[N]{\frac{FV\ of\ Cash\ inflows\ @\ Reinvestment\ rate}{PV\ of\ cash\ outflows\ @\ MARR}} - 1$$

Conventional BC ratio

$$Conventional\ BC\ Ratio = \frac{PW\ of\ Benefits}{Initial\ Cost + PW\ of\ O\&M\ Cost - PW\ of\ salvage\ value}$$

Modified BC ratio

$$Modified\ BC\ Ratio = \frac{PW\ of\ Benefits - PW\ of\ O\&M\ Cost}{Initial\ Cost - PW\ of\ salvage\ value}$$

Incremental Analysis:

If Incremental rate of return (ΔIRR_{B-A}) > MARR, Select B.

If Incremental rate of return (ΔIRR_{B-A}) < MARR , Select A.

If Incremental BCR (ΔBCR_{B-A}) > 1, Select B

If Incremental BCR (ΔBCR_{B-A}) < 1, Select A

Steps in Repeatability Method:

1. Compute LCM of useful life of all projects
2. Prepare new cash flow diagram with repeated projects for each alternatives taking life equal to LCM of useful life. Consider all repeated investment, salvage value annual cost and annual revenue in CFD.
3. Calculate EW (PW/FW/AW) of each project based on information from step 2.
4. Compare EW (PW/FW/AW) with each other and select with higher value of EW.

Steps in Co-terminated Method:

1. Access projects study period.
2. Develop cash flow diagram for terminating projects.
3. Calculate EW (PW/FW/AW) of all projects. For terminating project; projects with longer useful life will be terminated on study period, follow following steps:
   a. First, find CR amount terminating project
   b. Find Imputed Market Value (IMV) of terminating project:
      IMV= PV at EOY study period of salvage value + PV at EOY of study period of remaining capital recovery (CR) amount.
   c. Develop new cash flow diagram including IMV at the end of study period.
   d. Find PW of terminating project.

Compare PW/FW/AW with each other and select best one.

BEP (Simple Analysis): Total Cost=Total Revenue

Break-even Point (volume) = $\dfrac{\text{Fixed costs}}{\text{Sales price per unit - Variable cost per unit}}$

BEP (single project): To identify output volume or number of years or interest rate or other parameter

AV/EV of cash outflow=AV/EV of cash inflow

BEP (two project):

PV of cash outflow of Project X =PV of cash outflow of Project Y

Straight Line Depreciation Method:

$$Annual\ Depreciation = \frac{Initial\ Cost\ of\ asset\ (I) - Estimated\ salvage\ value(SV)}{Estimated\ life\ of\ the\ asset\ (N)}$$

Declining Balance Method:

$$Rate\ of\ Depreciation\ (R) = \frac{1}{N} \times 100 \times 2\ or\ 1.5$$

Under, the rate of depreciation (if declining multiplier is not give) is computed by using following formula:

$$Rate\ of\ Depreciation\ (R) = \sqrt[N]{\left(\frac{S}{I}\right)}$$

Sinking Fund Depreciation Method:
   Fixed annual depreciation amount (A)= (I-S)* (A/F, i, N)
   Net Depreciation Charges in year K= A* (F/P, i, K-1)
   Where, I=Initial cost, S=Salvage Value, N=Useful life

SOYD: SOYD=N (N+1)/2

$$SOYD\ Unit\ Deprecition\ Amount = \frac{I-S}{SOYD}$$

$SOYD\ Depreciation = Remaining\ useful\ life\ of\ an\ asset \times SOYD\ unit\ depreciation\ amount$
Depreciation on year t (D_t) = (N-t+1)*SOYD unit depreciation amount

Unit Depreciation Method:

$$Unit\ Depreciation\ Amount = \frac{(I-S)}{Total\ working\ hours\ or\ total\ production\ units}$$

$Depreciation\ amount\ on\ t\ year = Unit\ Depreciation\ Amount*Annual\ usage\ of\ machine\ or\ units\ of\ production\ on\ t^{th}\ year$

General Procedure for ATCF Estimates:
   1. Find gross income before depreciation expenses also known as BTCF
   2. Calculate depreciation expenses for each year
   3. Find Taxable income (Deduct depreciation from BTCF/gross income)
   4. Find taxes for each period
   5. Deduct tax amount from BTCF to get ATCF for each year
   6. Find NPW/NFW (Consider time value of money) and make economic analysis

EOY	BTCF (Given)	MACRS Dep. %	Depreciation (Given)	Taxable income (BTCF-Dep.)	Income Tax (40%)	ATCF (BTCF-Tax)

Cost of Retained Earnings (C_{RE}):

$$C_{RE} = \frac{D_1}{P_0} + g$$

Where, C_{RE}= Cost of Retained Earnings; D_1 = First Year dividend; P_0 = Current Stock Price; g= growth rate of dividend

Cost of Common Stock(C_{CS}):

$$C_{CS} = \frac{D_1}{P_0(1-FC)} + g$$

Cost of Preferred Stock(C_{PS}):

$$C_{PS} = \frac{D^*}{P^*(1-FC)}$$

Weighted Average Cost of Equity (WACE):

$$WACE = \frac{RE}{E} \times C_{RE} + \frac{CS}{E} \times C_{CS} + \frac{PS}{E} \times C_{PS}$$

Cost of Equity: Alternative way of determining cost of equity, CAPM

$$\text{Cost of equity} = R_f + \beta(R_m - R_f)$$

Cost of Debt:

After tax cost of debt = Interest (1-TR)

$$Weighted\ Average\ After\ tax\ cost\ of\ debt$$
$$= Weight\ of\ term\ loan \times After\ tax\ cost\ of\ debt + weight\ of\ bond$$
$$\times\ after\ tax\ cost\ of\ bond$$

Or

$$After\ tax\ cost\ of\ debt = \frac{TL}{D} \times C_{TL} \times (1 - TR) + \frac{B}{D} \times C_B \times (1 - TR)$$

Cost of Capital:

Weighted Average Cost of Capital:

$$WACC = Weight\ of\ equity \times Cost\ of\ equity + Weight\ of\ debt \times after\ tax\ cost\ of\ debt$$
$$WACC = \frac{E}{T} \times C_e + \frac{D}{T} \times C_d \times (1 - TR)$$

Financial Internal Rate of Return (FIRR) =Individual IRR of Private Investment

Economic Internal Rate of Return:

EIRR=FIRR + Profitability associated with consumer/user (due to consumer surplus + Profitability associated with externalities + Profitability associated with environment + Profitability associated with government surplus

ROE:

$$\text{Return on common equity} = \frac{\text{Net income available to common stockholders}}{\text{Total or Average common equity}}$$

Format of Trial Balance

Trial Balance of ABC Company

as on Asar 31, 2076

Account Title	L.F.	Debit Amount	Credit Amount
All Income items			*******
All Expenses items		********	
All Asset items		********	
All Liabilities items			********
All Capital items			********
Total		*********	********

Vertical Format of Income Statement (Trading and Profit and Loss Statement)

Income Statement of ABC Company

For the year ended Asar 31, 2075

Particulars	Amount Rs.
Sales/Revenue/Operating Income	…………..
Less: Purchase/Cost of goods sold	…………..
Less: Manufacturing/Operating Expenses (Wages, Carriage Inwards)	…………..
Gross Profit	********

Less: Non-manufacturing/Non operating Expenses (Rent, Salaries, Bad debts, Advertising Expenses, Depreciation, Selling expenses, Administrative expenses)	....
Operating Profit	********
Add: Non-operating Income (Interest received, Dividend received, Commission received)	....
Net Profit	********

Horizontal Format: Trading and Profit and Loss Account

Trading and Profit and Loss Account of ABC Company
For the year ended Asar 31, 2075

Dr.   Cr.

Expenses/Losses	Amount Rs.	Revenue/Gains	Amount Rs.
Opening Stock	....	Sales	....
Purchases	....	Gross Loss c/d	....
Wages	....		
Carriage Inwards	....		
Manufacturing Expenses	....		
Rent and Insurance of Factory	....		
Gross Profit c/d			
	********		********
Rent	....	Gross Profit b/d	....
Salaries	....	Interest received	....
Bad debts	....	Dividend received	....
Interest	....	Commission received	....
Advertising Expenses	....	Net Loss c/d	....
Depreciation	....		
Selling expenses	....		
Administrative expenses	....		
Net Profit c/d	....		
	********		********

Format of Statement of Retained Earnings

Statement of Retained Earnings of ABC Company
As at Asar 31, 2076

Particulars	Amount (Rs.)
Opening Retained Earnings	....
Add: Net Income	....
Less: Dividend paid to Preferred Stockholder	....
Less: Dividend paid to Common Stockholder	....
Less: Drawings	....
Closing Retained Earnings	********

Format of Balance Sheet

Balance Sheet of ABC Company
As at Asar 31, 2076

Capital and Liabilities	Amount Rs.	Assets	Amount Rs.
Capital ………..		Fixed Assets	………….
Add: Net Profit ………..	………….	Furniture	………….
Reserves/Funds	………….	Land and Building	………….
Long term loan	………….	Equipment	………….
Bonds/Debentures	………….	Current Assets	………….
Current Liabilities	………….	Cash	………….
Short term loan	………….	Bank	………….
Sundry creditors	………….	Sundry debtors	………….
Bills payable	………….	Closing stock	………….
Bank overdraft	………….	Goodwill	………….
	*********		********

Format of Cash Flow Statement

Cash Flow Statement of ABC Company
As on Asar 31, 2076

	Particulars	Amount (Rs.)
	Cash flow from Operating Activities:	
	Net Income	…………
	Add: All noncash expense items of income statement (e.g. Depreciation, Provision for Proposed dividends, Goodwill/Patent written off)	…………
		…………
	Add: Loss on sale of assets	…………
	Less: Profit on sale of assets	…………
	Add: Changes in working capital	
	Less: Tax Paid	
A	**Net cash provided by operating activities**	*******
	Cash flow from Investing Activities:	
	Cash inflow items of investing activities (e.g. sales of assets, securities)	…………
		…………
	Less: Cash outflow items of investing activities (e.g. purchase of assets, capital expenditure)	********
B	**Net cash provided by investing activities**	
	Cash flow from Financing Activities:	…………
	Cash inflow items of investing activities (e.g. stock issue, loan received)	…………
C	Less: Cash outflow items of investing activities (e.g. purchase of stock, payment of loan,)	********
	Net cash provided by investing activities	
D	**Net increase in cash (A+B+C)**	********
E	Add: Cash at the beginning of the period	…………
F	**Cash at end of the period (D+E)**	********

Summary of different ratios

Ratio	Calculation	Discussion	Recommendation
Debt Ratio	Total Liabilities/Total Assets	Indicates how much assets are invested through liabilities source	.4/1
Current Ratio	Current Assets/Current Liabilities	Indicates how much current assets are available to pay Rs. 1current liabilities	2/1
Quick (Acid test) Ratio	(Current Assets-Inventories)/Current Liabilities	Indicates how much quick assets are available to pay Rs. 1current liabilities	1/1
Inventory Turnover Ratio	Cost of goods sold/Average Inventory	How many times inventory turned into sales	Higher
Total Assets Turnover Ratio	Sales/Average Total Assets	Indicates overall efficiency of assets to sales	Higher
Gross Profit Margin on sales	Gross Profit/Sales	Shows the relationship between manufacturing cost and sales	Higher
Net Profit Margin on Sales	Net Profit/Sales	Shows the relationship between total cost and sales	Higher
Return on total Assets	Net income/Average total Assets	Earnings for all provides of capital	Higher
Price Earnings (PE) Ratio	Market Price of Share/Earning per share	Indicates future expectation	Higher
Book Value per share	(Total Shareholders equity-Preferred Share)/Average Share outstanding	Measures the amount of one share that would be distributed to shareholders if all assets sold and if all creditors are paid off	MPS>BVPS: Sell Share MPS<BVPS: Purchase Share

MACRS Depreciation Percentage

Year Class	Category of Property				
	3 (200%)	5 (200%)	7 (200%)	10 (200%)	15 (150%)
1	33.33	20.00	14.49	10.00	5.00
2	44.45	32.00	24.49	18.00	9.50
3	14.81*	19.20	17.49	14.40	8.55
4	7.41	11.52*	12.49	11.52	7.70
5		11.52	8.93*	9.22	6.93
6		5.76	8.92	7.37	6.23
7			8.93	6.55*	5.90*
8			8.93	6.55	5.90
9			4.46	6.56	5.91
10				6.55	5.90
11				3.28	5.91
12					5.90
13					5.91
14					5.90
15					5.91
16					2.95

*Indicates switchover decision (Conversion to straight line from declining balance method).