

List of formulas for Costing and FM

Cost Sheet

Format of cost sheet

Opening stock of Raw Materials	XX	
+ Purchases	XX	
- Closing stock	(XX)	XX
+ Direct wages		XX
+ Direct expenses		XX
Prime cost		XX
+ Factory overheads		XX
Gross Works cost		XX
+ Opening work in progress		XX
- Closing work in progress		(XX)
Net works cost/cost of Prod'n		XX
+ Opening finished goods		XX
- Closing finished goods		XX
Cost of goods sold		XX
+ Administration overheads		XX
+ Selling & Distribution overheads		XX
Cost of Sales		XX
+ Profit		XX
Sales		XX

Materials

➤ Economic order quantity

Where the purchase price is constant irrespective of the quantity purchased EOQ could be computed using Wilson formula. In case of multiple purchase prices price break model has to be followed.

- (a) Wilson formula: $\sqrt{(2 \cdot C \cdot O)/I}$ where C = Annual consumption; O = Cost per order; I = Holding cost per unit per annum.
- (b) Price break model: compute total cost of materials and select that lot size having the least total cost. Total cost = ordering cost + holding cost + purchase cost. Ordering cost = Number of orders * Cost per order; Holding cost = $1/2 \cdot \text{order size} \cdot I$; Purchase cost = purchase price * C.

➤ Computation of stock levels

- (a) Re-order level (ROL) = Maximum lead time * Maximum consumption
- (b) Minimum level = ROL - Average lead time * Average consumption
- (c) Maximum level = ROL + ROQ - (Minimum consumption * Minimum lead time)
- (d) Average level = (Minimum level + Maximum level) / 2
- (e) Danger level = Average consumption * Lead time during emergency purchase.

➤ **Treatment of material losses**

- (a) Normal losses: They should be treated as product cost. The cost of normal loss is recovered by good units. Such losses will be charged to the current P&L account to the extent of material consumed and balance is carried forward to the subsequent year Vide closing stock.
- (b) Abnormal loss: The entire loss is debited to P&L account (i.e.) it is treated as period cost.

➤ **Residual category of problems to be revised**

- (a) Issue valuation under different methods such as FIFO, LIFO, Wt.Avg, Simple Avg, Base stock, Replacement price and Standard cost.
- (b) Safety stock computation when stock out costs is given.
- (c) ABC analysis.

Labour

➤ **Some important formulas**

- (a) Time rate wages: $TT \times TR$
- (b) Piece rate wages: units produced * piece rate
- (c) Taylor's differential piece rate:

Efficiency	Piece rate
Below standard	80% piece rate
At or above standard	120% piece rate

- (d) Merricks multiple piece rate:

Efficiency	Piece rate
Upto 83%	Normal piece rate
83% to 100%	110% piece rate
Above 100%	120% piece rate

- (e) Gantt task bonus plan:

Efficiency	Wages
Below standard	Guaranteed time wages
At standard	120% time rate * std time
Above standard	120% time rate * std time for actual output

- (f) Halsey premium plan: $(TT \times TR) + 50\%(TS \times TR)$

- (g) Rowan premium plan: $(TT \times TR) + TS/TA(TS \times TR)$

- (h) Barth plan: $TR \times \sqrt{\text{std time} \times \text{actual time}}$

Note: TT=time taken; TS=time saved; TR=time rate; TA=time allowed

➤ **Labour turnover computation methods**

- (a) Separation method: Number of separations/Average labour
- (b) Replacement method: Number of replacements/Average labour

- (c) Flux method: (Number of replacements+number of separations)/Average labour

Note: Go through the problems involving computation of profit foregone due to labour turnover.

➤ **Treatment of Idle time**

- (a) Normal idle time: If it is that of direct workers treat it as direct wages and in other cases treat it as production overheads.
(b) Abnormal idle time: charge it to costing P&L account.

➤ **Treatment of overtime**

- (a) Regular feature in the organisation: inflate the wage rate to absorb the overtime premium also.
(b) To meet the seasonal demand: overtime premium should be treated as production overheads.
(c) To meet specific customer requirement: charge the over time premium to the specific job.
(d) Abnormal reasons: overtime premium should be debited to costing P&L account.

Overheads

➤ **Absorbtion of overheads**

- (a) Calculation of absorbtion rate: Overheads/suitable base
Note: Common bases used: labour hour; machine hour; material cost; labour cost; prime cost; production units.
(b) Charging to each unit of production: quantity of base contained in each production unit*absorbtion rate.

➤ **Under or over absorbtion computation**

Under or over absorbtion=actual overheads-Overheads absorbed (If positive under absorbtion else overabsorbtion)

Note:

- (a) Actual overheads actual rate*actual base
(b) Overhead absorbed=predetermined rate*actual base
(c) Predetermined rate=budgeted overheads/budgeted base
(d) Actual rate=actual overhead/actual base

➤ **Treatment of under or overabsorbtion**

- (a) Period cost method: transfer the amount of under or overabsorbtion to costing P&L account.
(b) Product cost method: calculate supplementary rate and distribute the under or over absorbtion between cost of goods sold and closing stock.

Activity based costing

➤ **Steps in activity based costing**

- (a) Identification of major activities in the organisation.
- (b) Collection of cost incurred for each activity. It is referred as cost pools.
- (c) Identification of the factor which drives the cost of each activity. It is called cost driver.
- (d) Finding out the quantum of cost driver consumed during the period.
- (e) Calculation of cost driver rate $[(b)/(d)]$
- (f) Charging the overheads to the product. Amount to be charged = cost driver rate * quantum of cost driver consumed by that product.

Process costing

➤ **Format of process account**

Particulars	Units	Amount	Particulars	Units	Amount
To Opening WIP			By normal loss		
To materials			By Transfer to next process		
To wages			By abnormal loss		
To overheads			By closing WIP		
To abnormal gain					

➤ **Steps in process accounts with losses**

- (a) Calculate the total process cost
- (b) Reduce the sales proceeds of normal loss scrap from (a)
- (c) Input-normal loss units=normal output
- (d) Cost per unit to be transferred to next process $(b)/(c)$

➤ **Steps in process accounts with WIP**

- (a) Statement of equivalent units
- (b) Statement of cost per equivalent units
- (c) Statement of apportionment
- (d) Process account.

Time value of money

- **$PVCF = CF * PVF$**
- **$FVCF = CF * FVF$**
- **$PVA = \text{Annuity} * PVAF$**
- **$FVA = \text{Annuity} * FVAF$**
- **$\text{Perpetuity} = CF / r$**

Note: PVF, FVF, PVAF, FVAF can be obtained from their respective tables or by using the following formulas:

(a) $PVF = 1/(1+r)^n$

(b) $FVF = (1+r)^n$

(c) $PVAF = 1/r [1-(1/(1+r)^n)]$

(d) $FVAF = [(1+r)^n - 1]/r$

(e) Where the annuity due is immediate multiply (c) or (d) with $(1+r)$.

Terms: PVF = present value factor; FVF = future value factor; PVAF = present value annuity factor; FVAF = future value annuity factor; CF = cash flows.

Capital budgeting

➤ **Maxims in calculation of cash flow under capital budgeting decisions**

- Consider only incremental cash flows
- Cash flows should be adjusted for effects on other projects
- After tax cash flows should be used
- No tax No depreciation
- In case of depreciation being relevant consider issues such as set-off and carry forward of unadjusted depreciation.
- Remove effect of financing decisions while computing cash flows.
- Remember to give effect to working capital adjustments.

➤ **Capital budgeting techniques: some formulas**

Non-discounting techniques

(a) **Average rate of return (ARR)** = Average profit / Average investment
Average investment = (Original investment-Salvage value)/2 + Salvage value + Additional working capital.

(b) **Pay back** = period at which the cumulative cash inflows equals the cash outflow.

Discounting techniques

(c) **Net present value (NPV)** = Present value of inflows – Present value of outflow

(d) **Internal rate of return:** It is the discount rate at which the net present value of the project cash flows become zero. Its calculation depends on the cash flow structure.

- Annuity cash flows: IRR can be computed by locating the present value factor in the annuity table for the number of years given in the problem. Present value factor to be located = original investment / annuity inflow.
- Non-Annuity cash flows: IRR is calculated by making trial calculations in an attempt to compute the correct interest rate, which makes the Net present, value zero. The first trial rate may be calculated on the basis of the method,

which is used to determine the IRR for an annuity cash flow. The only change is to substitute Average annual cash flow in place of Annuity inflow.

- (e) **Profitability index or Benefit cost ratio** = Present value of inflow / Present value of outflow.
- (f) **Discounted payback** = Same as pay back but instead of cash flows use discounted cash flow.

Leverages

➤ **Leverage formulas**

- (a) Degree of operating leverage (DOL) = contribution / EBIT or change in EBIT/change in sales.
- (b) Degree of financial leverage (DFL) = EBIT / [EBIT - I - PD/(1-t)] or change in EPS/change in EBIT
- (c) Degree of total leverage (DTL) = DOL*DFL or change in EPS/change in sales

➤ **Financial break even point**

It is the EBIT level at which the EPS is ZERO. Financial BEP = $I + PD/(1-t)$

➤ **Indifference point**

It is the level of EBIT at which the EPS under two different financing plans are same. Computation of indifference point is as follows:

- Assume X to be the EBIT at which the EPS of two financial plans are same.
- Solve the following equations to get the value of X
 $\{(X - I_1)(1 - T) - PD_1\} / \text{No. of equity shares} = \{(X - I_2)(1 - T) - PD_2\} / \text{No. of equity shares}$

Note: In comparing two financial plans, we should select financial plan having lower financial break even point, if the EBIT expected to be generated is below indifference point, be indifferent between both the plans if the expected EBIT is equal to indifference point and the other plan if the EBIT is above indifference point.

Cost of capital

➤ **Computation of individual components of cost of capital**

(a) Cost of debt

Irredeemable debt	Redeemable debt
$K_d = I(1-t) / SV$	$K_d = [I(1-t) + (RV-SV)/n] / (RV+SV)/2$ Or $K_d = \text{IRR of the cash flows associated with issue of debt}$

Note: I = Interest rate; t = Tax rate; SV = Issue proceeds; RV = Redemption value

(b) Cost of preference capital (K_p): Same computation procedure as that of debt except that tax will not feature in such computation.

(c) Cost of equity

Earnings model	Dividend model	Dividend growth model
$K_e = EPS / MPS$	$K_e = D_1 / P_o$	$K_e = \{D_1 / P_o\} + g$

Note: EPS = earnings per share; MPS = Market price per share ; D1 = expected dividend ; P_o =current market price.

➤ **overall cost of capital**

$$K_o = W_1 K_d + W_2 K_p + W_3 K_e$$

Ratio analysis

➤ **Liquidity ratios**

- Current ratio = current assets / current liabilities
- Quick ratio or acid test ratio = [current assets- inventories] / current liabilities
- Cash ratio = [cash+ marketable securities] /current liabilities
- Interval measure = [current assets-inventories]/Avg daily optg exp
- Net working capital ratio = Net working capital / Net assets

➤ **Leverage ratios or capital structure ratios**

- Debt equity ratio = Debt / Equity {equity means shareholders funds or networth}

Note:(1) Where Company uses fixed assets on long term lease, it commits itself to a series of fixed payments. The value of lease obligation is equivalent to debt. Therefore include the same in the debt.

(2) Preference share capital should be treated as part of equity while calculating debt equity ratio.

- Interest coverage ratios = EBDIT / I
- Fixed charges coverage ratios = [EBDIT+Lease rentals] / [Interest+Lease rentals + {preference dividend+loan repayment}/(1-t)]

➤ **Activity ratios**

- Inventory turnover ratio = cost of goods sold / Average inventory
- Debtors turnover ratio = credit sales / Average debtors
- Total assets turnover ratio = Sales / Total assets
- Fixed assets turnover ratios = Sales / Fixed assets
- Working capital turnover ratio = Sales / Working capital
- Capital turnover ratio = Sales / Capital employed { capital employed = fixed assets + working capital or debt + equity}

➤ **Profitability ratios**

- Gross profit ratio $= \text{Gross profit} / \text{Sales}$
- Net profit ratio $= \text{profit after tax} / \text{Sales}$
- Operating expense ratio $= \text{Operating expense} / \text{Sales}$
- Return on investments (ROI) $= [\text{Profit after tax} + \text{Interest}] / \text{Capital employed}$
- Return on Equity (ROE) $= \text{Profit after tax} / \text{Equity}$

➤ **Miscellaneous ratios**

- Earnings per share (EPS) $= \frac{\text{Profit after tax and preference dividend}}{\text{Number of equity shares}}$
- Dividend per share (DPS) $= \text{Dividend} / \text{Number of equity shares}$
- Dividend Payout ratio (D/P ratio) $= \text{DPS} / \text{EPS}$
- Price earning ratio (P/E ratio) $= \text{MPS} / \text{EPS}$

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