

# Cost and Management Accounting and Quantitative Techniques

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*These are notes which will help CA/CMA students in their studies*

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## CLASSIFICATION OF COSTS: Manufacturing

We first classify costs according to the three elements of cost:

a) Materials                      b) Labour                      c) Expenses

Product and Period Costs: We also classify costs as either

- 1 Product costs: the costs of manufacturing our products; or
- 2 Period costs: these are the costs other than product costs that are charged to, debited to, or written off to the income statement each period.

The classification of Product Costs:

Direct costs: Direct costs are generally seen to be variable costs and they are called direct costs because they are directly associated with manufacturing. In turn, the direct costs can include:

- Direct materials: plywood, wooden battens, fabric for the seat and the back, nails, screws, glue.
- Direct labour: sawyers, drillers, assemblers, painters, polishers, upholsterers
- Direct expense: this is a strange cost that many texts don't include; but (International Accounting Standard) IAS 2, for example, includes it. Direct expenses can include the costs of special designs for one batch, or run, of a particular set of tables and/or chairs, the cost of buying or hiring special machinery to make a limited edition of a set of chairs.

Total direct costs are collectively known as Prime Costs and we can see that Product Costs are the sum of Prime costs and Overheads.

Indirect Costs: Indirect costs are those costs that are incurred in the factory but that cannot be directly associate with manufacture. Again these costs are classified according to the three elements of cost, materials labour and overheads.

- Indirect materials: Some costs that we have included as direct materials would be included here.
- Indirect labour: Labour costs of people who are only indirectly associated with manufacture: management of a department or area, supervisors, cleaners, maintenance and repair technicians
- Indirect expenses: The list in this section could be infinitely long if we were to try to include every possible indirect cost. Essentially, if a cost is a factory

cost and it has not been included in any of the other sections, it has to be an indirect expense. Here are some examples include:

Depreciation of equipment, machinery, vehicles, buildings

Electricity, water, telephone, rent, Council Tax, insurance

Total indirect costs are collectively known as Overheads.

Finally, within Product Costs, we have Conversion Costs: these are the costs incurred in the factory that are incurred in the conversion of materials into finished goods.

The classification of Period Costs:

The scheme shows five sub classifications for Period Costs. When we look at different organisations, we find that they have period costs that might have sub classifications with entirely different names. Unfortunately, this is the nature of the classification of period costs; it can vary so much according to the organisation, the industry and so on. Nevertheless, such a scheme is useful in that it gives us the basic ideas to work on.

Administration Costs: Literally the costs of running the administrative aspects of an organisation. Administration costs will include salaries, rent, Council Tax, electricity, water, telephone, depreciation, a potentially infinitely long list. Notice that there are costs here such as rent, Council Tax, that appear in several sub classifications; in such cases, it should be clear that we are paying rent on buildings, for example, that we use for manufacturing and storage and administration and each area of the business must pay for its share of the total cost under review.

Without wishing to overly extend this listing now, we can conclude this discussion by saying that the costs of Selling, the costs of Distribution and the costs of Research are all accumulated in a similar way to the way in which Administration Costs are accumulated. Consequently, our task is to look at the selling process and classify the costs of running that process accordingly: advertising, market research, salaries, bonuses, electricity, and so on. The same applies to all other classifications of period costs that we might use.

Finance Costs: Finance costs are those costs associated with providing the permanent, long term and short term finance. That is, within the section headed finance costs we will find dividends, interest on long term loans and interest on short term loans.

Finally, we should say that we can add any number of subclassifications to our scheme if we need to do that to clarify the ways in which our organisation

operates. We will also add further subclassifications if we need to refine and further refine out cost analysis.

### **COST SHEET – FORMAT**

<u>Particulars</u>	<u>Amount</u>	<u>Amount</u>
Opening Stock of Raw Material	***	
<u>Add:</u> Purchase of Raw materials	***	
<u>Add:</u> Purchase Expenses	***	
<u>Less:</u> Closing stock of Raw Materials	***	
Raw Materials Consumed	***	
Direct Wages (Labour)	***	
Direct Charges	***	
Prime cost (1)		***
<u>Add :-</u> Factory Over Heads:		
Factory Rent	***	
Factory Power	***	
Indirect Material	***	
Indirect Wages	***	
Supervisor Salary	***	
Drawing Office Salary	***	
Factory Insurance	***	
Factory Asset Depreciation	***	
Works cost Incurred		***
<u>Add:</u> Opening Stock of WIP	***	
<u>Less:</u> Closing Stock of WIP	***	
Works cost (2)		***
<u>Add:-</u> Administration Over Heads:-		
Office Rent	***	
Asset Depreciation	***	
General Charges	***	
Audit Fees	***	
Bank Charges	***	
Counting house Salary	***	
Other Office Expenses	***	
Cost of Production (3)		***
<u>Add:</u> Opening stock of Finished Goods	***	
<u>Less:</u> Closing stock of Finished Goods	***	
Cost of Goods Sold		***

<u>Add:-</u> Selling and Distribution OH:-		
Sales man Commission	***	
Sales man salary	***	
Traveling Expenses	***	
Advertisement	***	
Delivery man expenses	***	
Sales Tax	***	
Bad Debts	***	
Cost of Sales (5)		***
Profit (balancing figure)		***
Sales		***

Notes:-

1) Factory Over Heads are recovered as a percentage of direct wages

2) Administration Over Heads, Selling and Distribution Overheads are recovered as a percentage of works cost.

### MATERIAL

- 1) Reorder level = Maximum usage \* Maximum lead time  
(Or) Minimum level + (Average usage \* Average Lead time)
- 2) Minimum level = Reorder level – (Average usage \* Average lead time)
- 3) Maximum level = Reorder level + Reorder quantity – (Minimum usage \* Minimum lead time)
- 4) Average level =  $\frac{\text{Minimum level} + \text{Maximum level}}{2}$  (or)  
Minimum level + ½ Reorder quantity
- 5) Danger level (or) safety stock level  
= Minimum usage \* Minimum lead time (preferred)  
(or) Average usage \* Average lead time  
(or) Average usage \* Lead time for emergency purposes
- 6) EOQ (Economic Order Quantity - Wilson's Formula) =  $\sqrt{2AO/C}$   
Where A = Annual usage units  
O = Ordering cost per unit  
C = Annual carrying cost of one unit  
i.e. Carrying cast % \* Carrying cost of unit
- 7) Associated cost = Buying cost pa + Carrying cost pa
- 8) Under EOQ Buying cost = Carrying cost
- 9) Carrying Cost = Average inventory \* Carrying cost per unit pa \* Carrying cost %  
(Or) Average Inventory \* Carrying cost per order pa
- 10) Average inventory = EOQ/2

11) Buying cost = Number of Orders \* ordering cost

12) Number of Orders = Annual Demand / EOQ

13) Inventory Turnover (T.O) Ratio =  $\frac{\text{Material consumed}}{\text{Average Inventory}}$

14) Inventory T.O Period =  $\frac{365}{\text{Inventory Turn over Ratio}}$

15) safety stock =  $\frac{\text{Annual Demand}}{365} * (\text{Maximum lead time} - \text{Average lead time})$

16) Total Inventory cost = Ordering cost + Carrying cost of inventory + Purchase cost

17) Input Output Ratio =  $\frac{\text{Quantity of input of material to production}}{\text{Standard material content of actual output}}$

Remarks :-

- 1) High Inventory T.O Ratio indicates that the material in the question is fast moving
- 2) Low Inventory T.O Ratio indicates over investment and locking up of working Capital in inventories

Pricing of material Issues:-

1) Cost price method:-

- a) Specific price method
- b) First in First Out method (FIFO)
- c) Last in First Out method (LIFO)
- d) Base stock method

2) Average price method:-

a) Simple average price method =  $\frac{\text{Total unit price}}{\text{Total No. of purchases}}$

b) Weighted average price method =  $\frac{\text{Total cost}}{\text{Total No. of units}}$

c) Periodic simple average price method =  $\frac{\text{Total unit price of certain period}}{\text{Total No. of units}}$



period Total Number of purchases of that  
 (This rate is used for all issues for that period. Period  
 means a month (or) week (or) year)

d) Periodic weighted average price method =  $\frac{\text{Total cost of certain period}}{\text{Total Number of units of that period}}$

e) Moving simple average price method  
 =  $\frac{\text{Total of periodic simple average of certain number of periods}}{\text{Number of periods}}$

f) Moving weighted average price method  
 =  $\frac{\text{Total of periodic weighted average of certain number of periods}}{\text{Number of periods}}$

3) Market price method:-

a) Replacement price method = Issues are valued as if it was purchased now at current market price

b) Realizable price method = Issues are valued at price if it is sold now

4) Notional price method:-

a) Standard price method = Materials are priced at pre determined rate (or) Standard rate

b) Inflated price method = The issue price is inflated to cover the losses incurred due to natural(or)climatic losses

5) Re use price method = When materials are returned (or) rejected it is valued at different price. There is no final procedure for this method.

ABC Analysis (or) Pareto Analysis :- In this materials are categorized into

<u>Particulars</u>	<u>Quantity</u>	<u>Value</u>
“A” – Important material	10%	70%
“B” – Neither important nor unimportant	20%	20%
“C” – UN Important	70%	10%

Note:-

- 1) Material received as replacement from supplier is treated as fresh supply
- 2) If any material is returned from Department after issue, it has to be first disposed in the next issue of material
- 3) loss in the book balance of stock and actual is to be transferred to Inventory adjustment a/c and from there if the loss is normal it is transferred to Over Head control a/c. If it is abnormal it is transferred to costing profit and loss a/c.
- 4) CIF = Cost Insurance and Freight (This consignment is inclusive of prepaid insurance and freight)
- 5) FOB = Free on Board (Materials moving by sea – insurance premium is not paid)
- 6) FOR = Free on Rail (Insurance and freight is not borne by the supplier but paid by the company or purchase)
- 7) For each receipt of goods = Goods Receipt note
- 8) For each issue of goods = Materials Requisition note (or) Material Issue note

Accounting Treatment :-

- 1) Normal Wastage = It should be distributed over goods output increasing per unit cost
- 2) Abnormal Wastage= It will be charged to costing profit and loss a/c
- 3) Sale value of scrap is credited to costing profit and loss a/c as an abnormal gain.
- 4) Sale proceeds of the scrap can be deducted from material cost or factory overheads.
- 5) Sale proceeds of scrap may be credited to particular job.
- 6) Normal Defectives = cost of rectification of defectives should be charged to specific
- 7) Abnormal Defectives = This should be charged to costing profit and loss a/c

- 8) Cost of Normal spoilage is to borne by good units
- 9) Abnormal spoilage should be charged to costing profit and loss a/c

## LABOUR

### Method of Remuneration:

- 1) Time Rate system
  - a) Flat time Rate
  - b) High wage system
  - c) Graduated time rate
  
- 2) Payment by Results
  - a) Piece rate system
    - i) Straight piece rate
    - ii) Differential piece rate
      - Taylor system
      - Merrick system
  
  - b) Group Bonus System
    - i) Budgeted Expenses
    - ii) Towne gain sharing scheme
    - iii) Cost efficiency bonus
    - iv) Priest man system
  
  - c) Combination of Time and Piece rate
    - i) Gantt task and Bonus scheme
    - ii) Emerson Efficiency system
    - iii) Point scheme
      - Bedaux system

- Haynes manit system

- d) Premium bonus plans
- i) Halsey premium plan
  - ii) Halsey weir premium plan
  - iii) Rowan scheme
  - iv) Barth scheme
  - v) Accelerating premium bonus scheme
- e) Other incentive schemes
- i) Indirect monetary incentive
    - Profit sharing
    - Co-partnership
  - ii) Non-Monetary Incentive

1) Time rate system = Hours worked \* Rate per hour (Basic wages)

2) Piece rate system:

i) Straight piece rate earnings = Number of units produced \* Rate per unit

ii) Differential Piece rate

- a) F.W.Taylor's differential rate system
  - » 83% of piece rate when below standard
  - » 125% of piece rate when above or at standard
- b) Merrick differential or multiple piece rate system

<u>Efficiency level</u>	<u>Piece rate</u>
» up to 83%	» Normal piece rate
» 83% to 100%	» 110% of Normal rate
» Above 100%	» 120% of Normal rate

iii) Gantt Task and Bonus system

<u>Output</u>	<u>Payment</u>
» Below standard	» Time rate (guaranteed)
» At standard	» 20% Bonus of Time rate
» Above standard	» 120% of ordinary piece rate

iv) Emerson's Efficiency system

<u>Efficiency</u>	<u>Payment</u>
» Below 66.7%	» Hourly Rate
» from 66.7% to 100%	» Hourly rate (+) increasing bonus according to degree of efficiency on the basis of step bonus rates
» Above 100%	» Hourly rate (+) 20% Bonus (+) additional bonus of 1% of hourly rate for every 1% increase in efficiency

v) Halsey Premium Plan = Basic wages + 50% of time saved \* Hourly Rate

vi) Halsey Weir Premium Plan = Basic wages + 30% of time saved \* Hourly rate

vii) Rowan Plan = Basic wages +  $\frac{\text{Time saved}}{\text{Time allowed}}$  \* Basic Wages

viii) Bedaus Point system = Basic wages + 75% \* Bedaus point/60 \* Rate/hr

ix) Barth's System = Hourly rate \*  $\sqrt{\text{Std time} * \text{Time taken}}$

#### Labour Turnover:-

1) Separation rate method =  $\frac{\text{Separation during the period}}{\text{Average No. of worker's during the period}}$

2) Net labour T.O rate (or) Replacement method  
=  $\frac{\text{Number of replacements}}{\text{Average No. of worker's during the period}}$

3) Labour flux rate =  $\frac{\text{No. of separation} + \text{No. of replacement}}{\text{Average No. of worker's during the period}}$

#### Accounting Treatment

1) Normal Idle time = Charged to factory overheads

2) Normal but un-controllable = It should be charged to job by inflating wage rate.

3) Abnormal = It should be charged to costing P & L a/c

## OVER HEADS

Reapportionment of service department expenses over production department :-

1) Direct redistribution method:

- Service department costs are divided over production department.
- Ignore service rendered by one dept. to another

2) Step method of secondary distribution (or) Non reciprocal method:

- Service department which serves largest number of service department is divided first and go on.

3) Reciprocal service method:

i) Simultaneous equation method (or) Algebraic method

- Equation is formed between service departments and is solved to find the amount due.

ii) Repeated distribution method:

- Service department cost separated repeatedly till figure of service dept. is exhausted or too small.

iii) Trial and Error method:

- Cost of service department is apportioned among them repeatedly till the amount is negligible and the total is divided among production department.

Treatment of Over/Under absorption of overheads:-

- If under absorbed and over absorbed overheads are of small value then it should be transferred to costing profit and loss a/c
- If under and over absorption occurs due to wrong estimates then cost of product manufactured should be adjusted accordingly.
- If the same accrued due to same abnormal reasons the same should be transferred to costing profit & loss a/c

Apportionment of overhead expenses – Basis

- Stores service expenses = Value of materials consumed
- Factory rent = Floor area
- Municipal rent, rates and taxes = floor area
- Insurance on Building and machinery = Insurable value
- Welfare department expenses
- Supervision
- Amenities to employee's
- Employees liability for insurance
- Lighting power = Plug point
- Stores over heads = Direct material
- General over heads = Direct wages

Number of employees

Reapportionment of service department cost to production department :-

- Maintenance dept. = Hours worked for each dept.

- 2) Pay roll and time keeping = Total labour (or) machine hours (or) Number of employees in each department
- 3) Employment (or) Personnel department = Rate of labour T.O (or) No. of employees of each department
- 4) Stores Keeping department = No. of requisitions (or) value of materials of each department
- 5) Purchase department = No. of purchase orders value of materials of each department
- 6) Welfare, ambulance, canteen, service, recreation room expenses  
= No. of employees in each department.
- 7) Building service department = Relative area each dept.
- 8) Internal transport service (or) overhead crane service  
= weight, value graded product handled, weight and distance traveled.
- 9) Transport department = Crane hours, truck hours, truck mileage,  
Number of packages.
- 10) Power house (electric power cost) = Housing power, horse power machine hours,  
No. of electric points etc.
- 11) Power house = Floor area, cubic content.



## RECONCILIATION OF COST AND FINANCIAL A/C

### Causes of differences:-

#### 1) Purely financial items :

- i) Appropriation of profits ► Transferred to reserves, goodwill, preliminary expenses, dividend paid etc.
- ii) Loss on sale of investment, penalties and fines
- iii) Income ► Interest received on Bank deposits, profit on sale of investments, fixed assets, transfer fees.

#### 2) Purely cost account items: - Notional Rent / Interest / Salary

#### 3) Valuation of stock:-

- i) Raw-material = In financial a/c's stock is valued at cost or market value  
Whichever is less, while in cost a/c's it is valued at LIFO, FIFO etc.
- ii) Work in progress = In financial a/c's administrative expenses are also considered while valuing stock, but in cost a/c's it may be

valued at prime (or) factory cost (or) cost of production

iii) Finished Goods = In financial a/c's it is valued at cost or market price whichever is less, in cost a/c's it is valued at total cost of production.

4) Overheads: In financial = Actual expenses are taken

In cost = Expenses are taken at predetermined rate.

5) Depreciation: In financial = Charged in diminishing or fixed balance method

In cost = Charged in machine hour rate

6) Abnormal Gains: In financial = Taken to profit & Loss a/c

In cost = Excluded to cost a/c's or charged in costing profit & Loss a/c

### **JOB AND BATCH COSTING**

With job costing, we are dealing with one off situations. We are dealing with organisations that carry out functions and services on a one at a time basis. Good examples of job costing situations include jobbing builders: the builder who will provide a householder, or a shop owner, or a factory owner with a service that he provides for no one else. The jobbing builder will build an extension, or renovate some property to a design that will probably not be copied anywhere else at any time: it is a one off job. Job costing can apply in non manufacturing situations as well as in manufacturing situations.

Even though many jobbing enterprises are small scale, we are not suggesting that all jobbing enterprises are small scale enterprises. An engineering shop may be working on a job for a customer that takes several months and many man and machine hours to complete.

Here are two definitions:

A job is “A customer order or task of relatively short duration”

Job costing is “A form of specific order costing; the attribution of cost to jobs”

Batch costing is not normally seen as much of an advance on job costing.

A batch is A group of similar articles which maintains its identity throughout one or more stages of production and is treated as a cost unit Batch costing is A form of specific order costing; the attribution of costs to batches.

Economic Batch Quantity =  $EBQ = \sqrt{2AS/C}$

Where A = Annual Demand

S = Setting up cost per batch

C= Carrying cost / unit of production.

## PROCESS COSTING

Format of process a/c

Particulars	Unit	Rate	Rs.	Particulars	Unit	Rate	Rs.
To Direct material				By Normal Loss			
To Direct Labour				By Units transferred to other process			
To Indirect material				By Abnormal loss (B/F)			
To Other Expenses							
To Abnormal gain(B/F)							
Total				Total			

Format of Abnormal loss

Particulars	Unit	Rs.	Particulars	Unit	Rs.
To Process a/c			By Sale of wasted units		
			By costing P & L a/c		
Total			Total		

### Format of Abnormal gain a/c

Particulars	Units	Rs.	Particulars	Units	Rs.
To Normal Loss a/c			By Process a/c (names of different process)		
To costing P&Ia/c					
Total			Total		

- 1) To find the cost per unit for valuation of units to be trans. to next process and also for abnormal, loss or gain = 
$$\frac{\text{Total process cost} - \text{Salvage value of normal spoilage}}{\text{Total units introduced} - \text{Normal loss in units}}$$
- 2) To find abnormal loss (or) gain (all in units):  
= Units from previous process + fresh units introduced – Normal loss – units transferred to next process (If the result is positive then abnormal loss. If negative then abnormal gain)
- 3) In case of opening WIP and closing WIP are given then there are different methods of valuation of closing WIP
  - i) FIFO Method
  - ii) LIFO Method
  - iii) Average Method
  - iv) Weighted Average Method
- 4) Various statements to be prepared while WIP is given:
  - i) Statement of equivalent production
  - ii) Statement of cost
  - iii) Statement of apportionment of cost
  - iv) Process cost a/c
- 5) FIFO Method: In these method total units transferred to next process includes full opening stock units and the closing stock includes the units introduced during the process. In this method the cost incurred during the process is assumed as to be used
  - a) First to complete the units already in process
  - b) Then to complete the newly introduced units
  - c) For the work done to bring closing inventory to given state of completion
- 6) LIFO Method = Cost incurred in process is used for:
  - a) First to complete newly introduced units
  - b) Then to complete units already in process in this method closing stock is divided into two :

- period
- i) Units which represent opening stock but lie at the end of the period
  - ii) Newly introduced units in closing stock.

7) Average Method: In this method

- a) No distinction is made between opening stock and newly introduced material.
- b) In finding cost per unit, cost incurred for opening stock is also to be added with current cost. (This addition is not done in LIFO & FIFO method as cost incurred in that process is only taken)

8) Weighted average method: This method is only used when varied product in processed through a single process. General procedure is adopted here.

- a) Statement of weighted average production should be prepared. Under this statement output of each products is expressed in terms of points.
- b) Cost of each type of product is computed on basis of Points.

Points of vital importance in case of Abnormal Gain / Loss:

- a) Calculate cost per unit by assuming there is no abnormal loss / gain
- b) Cost per unit arrived above should be applied for valuation of both abnormal Loss/gain units and output of the process.
- c) Separate a/c for both abnormal loss/gain is to be prepared.

### **JOINT PRODUCT AND BY PRODUCT COSTING**

Methods of apportioning joint cost over joint products :

- 1) Physical unit method = Physical base to measure (i.e.) output quantity is used to separate joint cost. Joint cost can be separated on the basis of ratio of output quantity. While doing this wastage is also to be added back to find total quantity.
- 2) Average unit cost method = In this method joint cost is divided by total units Produced of all products and average cost per unit is arrived and is multiplied With number of units produced in each product.
- 3) Survey method or point value method = Product units are multiplied by points or

weights and the point is divide on that basis.

- 4) Standard cost method = Joint costs are separated on the basis of standard cost set for respective joint products.
- 5) Contribution margin method = Cost are divided into two categories (i.e.) variable and fixed. Variable costs are separated on unit produced. Fixed on the basis of contribution ratios made by different products.
- 6) Market value method:-
  - a) Market value at the point of separation: Joint cost to sales revenue  $\square$  percentage is found which is called as multiplying factor =  $\frac{\text{Joint cost}}{\text{Sales Revenue}} * 100$ 
    - Joint cost for each product is apportioned by applying this % on sales revenue of each product.
    - Sales revenue = Sales Revenue at the point of separation.
    - This method cannot be done till the sales revenue at the separation point is given.
  - b) Market value after processing: Joint cost is apportioned on the basis of total sales Value of each product after further processing.
  - c) Net Realizable value method = Form sales value following items are deducted
    - i) Estimated profit margin
    - ii) Selling and distribution expenses if any included.
    - iii) Post split off cost

The resultant amount is net realizable value. Joint cost is apportioned on this basis.

#### Bi-product → Method of accounting

- Treat as other income in profit and loss a/c
- Net Realizable value of Bi-product is reduced from cost of main product.
- Instead of standard process, Standard cost or comparative price or re-use price is credited to joint process a/c.

## **OPERATION COSTING**

Service costing is “A cost accounting method concerned with establishing the costs of services rendered”. Service costing is also applied within a manufacturing setting.

The Differences Between Product Costing and Service Costing?

- There may be very few, if any, materials to worry about
- Overheads will comprise the most significant portion of any costs of which, labour costs may well comprise as much as 70%

No.	Enterprise	Cost per unit
1.	Railways or bus companies	Per passenger-kilometer
2.	Hospital	Per patient/day, per bed/day
3.	Canteen	Meals served , cups of tea
4.	Water supply service	Per 1000 gallons
5.	Boiler House	1000 kg of steam
6.	Goods Transport	Per tonne km, quintal km
7.	Electricity Boards	Per kilowatt – hours
8.	Road maintenance department	Per mile or road maintenance
9.	Bricks	One thousand
10.	Hotel	Per room/day

In this various terms such as passenger km, quintal km, tonne km, these are all known as composite units and are computed in 2 ways:

- a) Absolute (weighted average): (e.g.) tones km - Multiplying total distance by respective load quantity.
- b) Commercial (simple average): (e.g.) tonne Km–Multiplying total distance by average load quantity

All accumulated cost is classified into 3 categories:

- 1) Standing charges (or) fixed cost
- 2) Running cost (or) variable cost
- 3) Maintenance charges (or) semi variable cost

Running charges = Fuel, Driver Wages, Depreciation, oil etc.

Maintenance charges = Supervision salary, Repairs and Maintenance

Note:-

- % of factory overheads on direct wages
- % of administration overheads on works cost
- % of selling & distribution overheads on works cost
- % of profit on sales

Operating cost sheet :-



	Particulars	Total cost	Cost per km
A	<u>Standing charges :-</u> License fees Insurance Premium Road tax Garage rent Driver's wages Attendant-cum-cleaner's wages Salaries and wages of other staff		
	Total		
B	<u>Running charges :-</u> Repairs and maintenance Cost of fuel (diesel, petrol etc.) Lubricants, grease and oil Cost of tires, tubes and other spare parts Depreciation		
	Total		
C	Total charges [ (A) + (B) ]		

### **CONTRACT COSTING**

Contract costing is “A form of specific order costing; attribution of costs to individual contracts”.

A contract cost is “Aggregated costs of a single contract; usually applies to major long term contracts rather than short term jobs”.

Features of long term contracts:

- By contract costing situations, we tend to mean long term and large contracts: such as civil engineering contracts for building houses, roads, bridges and so on. We could also include contracts for building ships, and for providing goods and services under a long term contractual agreement.
- With contract costing, every contract and each development will be accounted for separately; and does, in many respects, contain the features of a job costing situation.
- Work is frequently site based.

We might have problems with contract costing in the following areas

- Identifying direct costs
- Low levels of indirect costs
- Difficulties of cost control
- Profit and multi period projects

The source of the following has eluded me: my sincere gratitude for whoever the author might be.

"Contract Costing such jobs take a long time to complete & may spread over two or more of the contractor's accounting years”.

### **Features of a Contract**

- The end product
- The period of the contract
- The specification
- The location of the work
- The price
- Completion by a stipulated date
- The performance of the product

### **Collection of Costs :**

Desirable to open up one or more internal job accounts for the collection of costs. If the contract not obtained, preliminary costs be written off as abortive

contract costs in P&L In some cases a series of job accounts for the contract will be necessary:

- to collect the cost of different aspects
- to identify different stages in the contract

### Special features

- Materials delivered direct to site.
- Direct expenses
- Stores transactions.
- Use of plant on site

### Two possible accounting methods:

Where a plant is purchased for a particular contract & has little further value to the business at the end of the contract

Where a plant is bought for or used on a contract, but on completion of the contract it has further useful life to the business

Alternatively the plant may be capitalised with Maintenance and running costs charged to the contract."

Format:-

Particulars	Rs.	Particulars	Rs.
To Materials		By materials returned	**
a. Purchased directly	**	By Material sold (cost price)	**
b. Issue from site	**		
c. Supplied by contractee	**		
To Wages and salaries	**	By WIP	
To Other direct Expenses	**	Work certified	**
To Sub-contractor fees	**	Work Uncertified	**
To Plant & Machinery (purchase price/Book value)	**	By Materials at site	**
To Indirect expenditure (apportioned share of overheads)	**	By Plant and machinery(WDV)	**
To Notional profit (Surplus)	**		
Total		Total	**

Profit of Incomplete contract :-

- 1) When % of completion is less than or equal to 25% then full Notional profit is transferred to reserve.
- 2) When % of completion is above 25% but less than 50% following amount should be credited to profit & loss a/c =  $1/3 * \text{Notional Profit} * \{\text{Cash received} / \text{Work certified}\}$
- 3) When % of completion is more than or equal to 50% then the amount transferred to profit is =  $2/3 * \text{Notional Profit} * \{\text{Cash received} / \text{Work certified}\}$   
[Balance is transferred to reserve a/c]
- ⊙ % of completion =  $\{\text{Work certified} / \text{Contract price}\} * 100$
- 4) When the contract is almost complete the amount credited to profit & loss a/c is
  - a) Estimated total profit \*  $\{\text{Work certified} / \text{Contract price}\}$
  - b) Estimated total profit \*  $\{\text{Cash received} / \text{Contract price}\}$
  - c) Estimated total profit \*  $\{\text{Cost of work done} / \text{Estimated total profit}\}$
  - d) Estimated total profit \*  $\{\frac{\text{Cost of work done} * \text{Cash received}}{\text{Estimated total cost} * \text{Work certified}}\}$

5) Work-In-Progress is shown in Balance Sheet as follows:-

#### Skeleton Balance sheet

Liabilities	(RS)	Asset	(Rs)
Profit & loss a/c (will include)		Work-in-progress	
Profit on contract (Specify the contract number)		Value or work certified	
Less : Loss on contract (Specify the contract number)		Cost of work uncertified	
Sundry creditors (will include)		Less :- Reserve for unrealized profit	
Wages accrued		Less :- Amount received from contractee	
Direct expenses accrued			
Any other expenses (Specify)			

- 6) Escalation Clause = This is to safeguard against likely change in price of cost elements rise by and certain % over the prices prevailing at the time tendering the contractee has to bear the cost.

## MARGINAL COSTING

### Statement of profit:-

Particulars	Amount
Sales	***
Less:- Variable cost	***
Contribution	***
Less:- Fixed cost	***
Profit	***

- 1) Sales = Total cost + Profit = Variable cost + Fixed cost + Profit
- 2) Total Cost = Variable cost + Fixed cost
- 3) Variable cost = It changes directly in proportion with volume
- 4) Variable cost Ratio = { Variable cost / Sales } \* 100
- 5) Sales – Variable cost = Fixed cost + Profit
- 6) Contribution = Sales \* P/V Ratio
- 7) Profit Volume Ratio [P/V Ratio]:-
  - { Contribution / Sales } \* 100
  - { Contribution per unit / Sales per unit } \* 100
  - { Change in profit / Change in sales } \* 100
  - { Change in contribution / Change in sales } \* 100
- 8) Break Even Point [BEP]:-
  - Fixed cost / Contribution per unit [in units]
  - Fixed cost / P/V Ratio [in value] (or)  $\frac{\text{Fixed Cost} * \text{Sales value per unit}}{(\text{Sales} - \text{Variable cost per unit})}$
- 9) Margin of safety [MOP]
  - Actual sales – Break even sales
  - Net profit / P/V Ratio
  - Profit / Contribution per unit [In units]
- 10) Sales unit at Desired profit = { Fixed cost + Desired profit } / Cont. per unit
- 11) Sales value for Desired Profit = { Fixed cost + Desired profit } / P/V Ratio

12) At BEP Contribution = Fixed cost

13) Variable cost Ratio =  $\frac{\text{Change in total cost}}{\text{Change in total sales}} * 100$

14) Indifference Point = Point at which two Product sales result in same amount of profit

=  $\frac{\text{Change in fixed cost}}{\text{Change in variable cost per unit}}$  (in units)

=  $\frac{\text{Change in fixed cost}}{\text{Change in contribution per unit}}$  (in units)

=  $\frac{\text{Change in Fixed cost}}{\text{Change in P/Ratio}}$  (in Rs.)

=  $\frac{\text{Change in Fixed cost}}{\text{Change in Variable cost ratio}}$  (in Rs.)

15) Shut down point = Point at which each of division or product can be closed

=  $\frac{\text{Maximum (or) Specific (or) Available fixed cost}}{\text{P/V Ratio (or) Contribution per unit}}$

If sales are less than shut down point then that product is to shut down.

Note :-

1) When comparison of profitability of two products if P/V Ratio of one product is greater than P/V Ratio of other Product then it is more profitable.

2) In case of Indifference point if

Sales > Indifference point --- Select option with higher fixed cost (or) select option with lower fixed cost.

## STANDARD COSTING

Method one of reading:-

Material:-

$$\begin{array}{cccc} \frac{SP * SQ}{(1)} & \frac{SP * AQ}{(2)} & \frac{SP * RSQ}{(3)} & \frac{AP * AQ}{(4)} \end{array}$$

- a) Material cost variance = (1) – (4)
- b) Material price variance = (2) – (4)
- c) Material usage variance = (1) – (2)
- d) Material mix variance = (3) – (2)
- e) Material yield variance = (1) – (3)

Labour :-

$$\begin{array}{cccccc} \frac{SR*ST}{(1)} & \frac{SR*AT}{(2)} \text{ (paid)} & \frac{SR*RST}{(3)} & \frac{AR*AT}{(4)} & \frac{SR*AT}{(5)} \text{ (worked)} \end{array}$$

- a) Labour Cost variance = (1) – (4)
- b) Labour Rate variance = (2) – (4)
- c) Labour Efficiency variance = (1) – (2)
- d) Labour mix variance = (3) – (5)
- e) Labour Idle time variance = (5) – (2)

Variable Overheads cost variance :-

$$\begin{array}{ccc} \frac{SR * ST}{(1)} & \frac{SR * AT}{(2)} & \frac{AR * AT}{(3)} \end{array}$$

- a) Variable Overheads Cost Variance = (1) – (3)
- b) Variable Overheads Expenditure Variance = (2) – (3)
- c) Variable Overheads Efficiency Variance = (1) – (2)

[ Where: SR = Standard rate/hour =  $\frac{\text{Budgeted variable OH}}{\text{Budgeted Hours}}$  ]

Fixed Overheads Cost Variance:-

$$\begin{array}{ccccc} \frac{SR*ST}{(1)} & \frac{SR*AT}{(2)} \text{ (worked)} & \frac{SR*RBT}{(3)} & \frac{SR*BT}{(4)} & \frac{AR*AT}{(5)} \text{ (paid)} \end{array}$$

- a) Fixed Overheads Cost Variance = (1) – (5)

- b) Fixed Overheads Budgeted Variance = (4) – (5)  
 c) Fixed Overheads Efficiency Variance = (1) – (2)  
 d) Fixed Overheads Volume Variance = (1) – (4)  
 e) Fixed Overheads Capacity Variance = (2) – (3)  
 f) Fixed Overheads Calendar Variance = (3) – (4)

Sales value variance:-

<u>Budgeted Price*BQ</u>	<u>BP*AQ</u>	<u>BP*Budgeted mix</u>	<u>AP*AQ</u>
(1)	(2)	(3)	(4)

- a) Sales value variance = (4) – (1)  
 b) Sales price variance = (4) – (2)  
 c) Sales volume variance = (2) – (1)  
 d) Sales mix variance = (2) – (3)  
 e) Sales quantity variance = (3) – (1)

Note :-

i) Actual margin per unit (AMPU) = Actual sale price – selling cost per unit

ii) Budgeted margin per unit (BMPU) = Budgeted sale price – selling price per unit

Sales margin variance :-

<u>BMPU*BQ</u>	<u>BMPU*AQ</u>	<u>BMPU*Budgeted mix</u>	<u>AMPU*AQ</u>
(1)	(2)	(3)	(4)

- a) Sales margin variance = (4) – (1)  
 b) Sales margin price variance = (4) – (2)  
 c) Sales margin volume variance = (2) – (1)  
 d) Sales margin mix variance = (2) – (3)  
 e) Sales margin quantity variance = (3) – (1)

Control Ratio :-

1) Efficiency Ratio =  $\frac{\text{Standard hours for actual output}}{\text{Actual hours worked}} * 100$

2) Capacity Ratio =  $\frac{\text{Actual Hours Worked}}{\text{Budgeted Hours}} * 100$

3) Activity Ratio =  $\frac{\text{Actual hours worked}}{\text{Budgeted hours}} * 100$



### Budgeted Hours

Verification: Activity Ratio = Efficiency \* Capacity Ratio

## STANDARD COSTING

Method two of reading:-

Material:-

- a) Material cost variance =  $SC - AC = (SQ * AQ) - (AQ * AP)$
- b) Material price variance =  $AQ (SP - AP)$
- c) Material usage variance =  $SP (SQ - AQ)$
- d) Material mix variance =  $SP (RSQ - AQ)$
- e) Material yield variance =  $(AY - SY \text{ for actual input})$  Standard material cost per unit of output
- f) Material revised usage variance (calculated instead of material yield variance) =  $[\text{standard quantity} - \text{Revised standard quantity for actual output}] * \text{Standard price}$

Labour :-

- a) Labour Cost variance =  $SC - AC = (SH * SR) - (AH * AR)$
- b) Labour Rate variance =  $AH (SR - AR)$
- c) Labour Efficiency or time variance =  $SR (SH - AH)$
- d) Labour Mix or gang composition Variance =  $SR(RSH - AH)$
- e) Labour Idle Time Variance = Idle hours \* SR
- f) Labour Yield Variance =  $[\text{Actual Output} - \text{Standard output for actual input}] * \text{Standard labour cost/unit of output}$

g) Labour Revised Efficiency Variance (instead of LYV) =  
 [Standard hours for actual output – Revised standard hours] \* Standard rate

Notes :- i)  $LCV = LRV + LMV + ITV + LYV$

ii)  $LCV = LRV + LEV + ITV$

iii)  $LEV = LMV, LYV$  (or)  $LREV$

Overhead variance :- (general for both variable and fixed)

a) Standard overhead rate (per hour) =  $\frac{\text{Budgeted Overheads}}{\text{Budgeted Hours}}$

b) Standard hours for actual output =  $\text{Budgeted hours} * \frac{\text{Actual Output}}{\text{Budgeted output}}$

c) Standard OH = Standard hrs for actual output \* Standard OH rate per hour

d) Absorbed OH = Actual hrs \* Standard OH rate per hour

e) Budgeted OH = Budgeted hrs \* Standard OH rate per hour

f) Actual OH = Actual hrs \* Actual OH rate per hour

g) OH cost variance = Absorbed OH – Actual OH

Variable Overheads variance :-

a) Variable OH Cost Variance = Standard OH – Actual OH

b) Variable OH Exp. Variance = Absorbed OH – Actual Variable OH

c) Variable OH Efficiency Variance = Standard OH – Absorbed OH  
 =  $[\text{Standard hours for actual output} - \text{Actual hours}] * \text{Standard rate for variable OH}$

Fixed Overheads variance :-

a) Fixed OH Cost Variance = Standard OH – Actual OH

b) Fixed OH expenditure variance = Budgeted OH – Actual OH

c) Fixed OH Efficiency Variance = Standard OH (units based) – Absorbed OH  
(Hours based)

d) Fixed OH Volume Variance = Standard OH – Budgeted OH  

$$= \left[ \frac{\text{Standard hrs for actual output} - \text{Budgeted hrs}}{\text{Budgeted hrs}} \right] * \text{standard rate}$$

e) Fixed OH capacity variance = Absorbed OH – Budgeted OH

f) Fixed OH Calendar Variance = [Revised budgeted hrs – Budgeted hrs]  

$$* \text{Standard rate/hrs}$$

Note:- When there is calendar variance capacity variance is calculated as follows :-

Capacity variance = [Actual hours – Revised Budgeted hrs] \* Standard rate/hour  
 (Revised)

Verification :-

i) variable OH cost variance = Variable OH Expenditure variance  

$$+ \text{Variable OH Efficiency variance}$$

ii) Fixed OH cost variance = Fixed OH Expenditure variance + Fixed OH volume  
 variance

iii) Fixed OH volume variance = Fixed OH Efficiency variance + Capacity variance  

$$+ \text{Calendar variance}$$

Sales variances :-

Turnover method (or) sales value method :-

a) Sales value variance = Actual Sales – Budgeted Sales

b) Sales price variance = [Actual Price – Standard price] \* Actual quantity  

$$= \text{Actual sales} - \text{standard sales}$$

c) Sales volume variance = [Actual-Budgeted quantity] \* Standard price  

$$= \text{Standard sales} - \text{Budgeted sales}$$

d) Sales mix variance = [Actual quantity – Revised standard quantity] \* Standard price  

$$= \text{Standard sales} - \text{Revised sales}$$

$$\begin{aligned} \text{e) Sales quantity variance} &= [\text{Revised standard variance} - \text{Budgeted quantity}] \\ &\quad * \text{Standard price} \\ &= \text{Revised Standard sales} - \text{Budgeted sales} \end{aligned}$$

Profit method:-

$$\begin{aligned} \text{a) Total sales margin variance} &= (\text{Actual Profit} - \text{Budgeted price}) \\ &= \{ \text{Actual quantity} * \text{Actual profit per unit} \} - \\ &\quad \{ \text{Budgeted quantity} * \text{Standard profit per unit} \} \end{aligned}$$

$$\begin{aligned} \text{b) Sales margin price variance} &= \text{Actual profit} - \text{Standard profit} \\ &= \{ \text{Actual Profit per unit} - \text{Standard profit per unit} \} * \text{Actual quantity of sales} \end{aligned}$$

$$\begin{aligned} \text{c) Sales margin volume variance} &= \text{Standard profit} - \text{Budgeted Profit} \\ &= \{ \text{Actual quantity} - \text{Budgeted quantity} \} * \text{Standard profit per unit} \end{aligned}$$

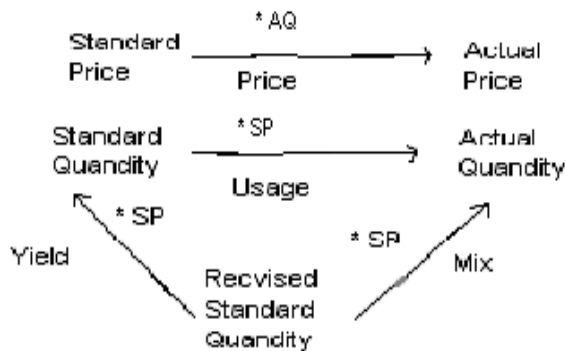
$$\begin{aligned} \text{d) Sales margin mix variance} &= \text{Standard profit} - \text{Revised Standard profit} \\ &= \{ \text{Actual quantity} - \text{Revised standard quantity} \} * \text{Standard profit per unit} \end{aligned}$$

$$\begin{aligned} \text{e) Sales margin quantity variance} &= \text{Revised standard profit} - \text{Budgeted profit} \\ &= \{ \text{Revised standard quantity} - \text{Budgeted quantity} \} * \text{Standard profit per unit} \end{aligned}$$

## STANDARD COSTING

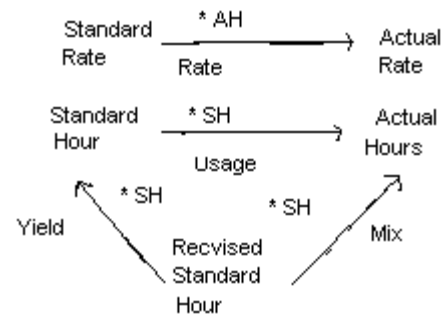
Diagrammatic Representation: -

Material Variance: -



$$\text{Material cost variance} = \text{SC} - \text{AC} = (\text{SQ} * \text{AQ}) - (\text{AQ} * \text{AP})$$

Labour Variances:-



$$\text{Labour Cost variance} = \text{SC} - \text{AC} = (\text{SH} * \text{SR}) - (\text{AH} * \text{AR})$$

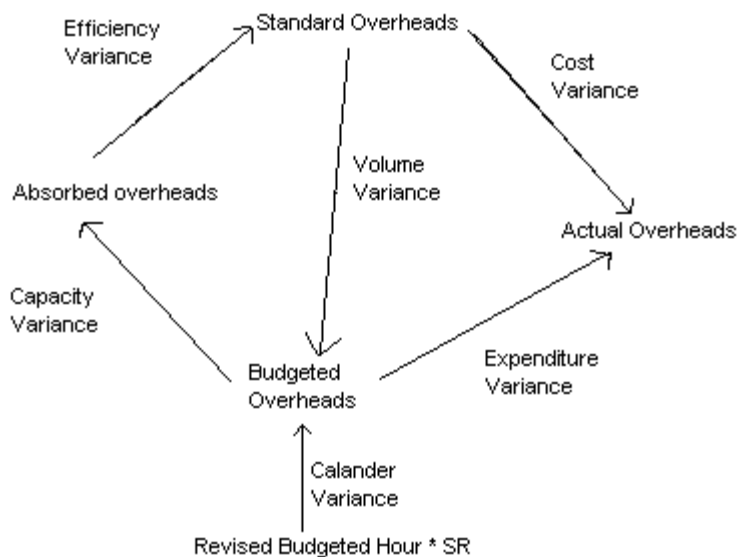
Fixed Overhead Variance : -

a) Standard OH = Standard hrs for actual output \* Standard OH rate per hour

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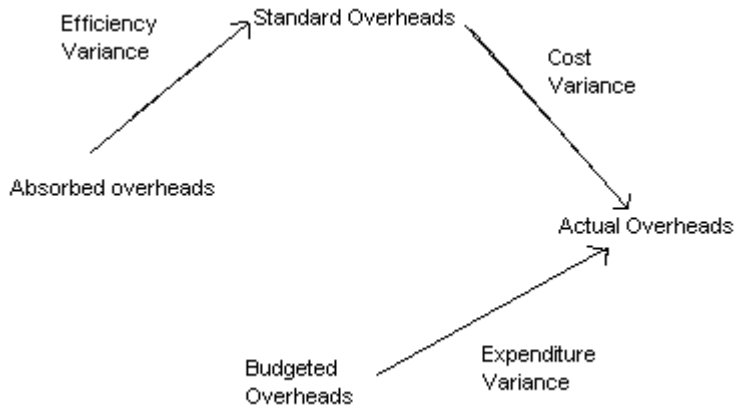
- b) Absorbed OH = Actual hrs \* Standard OH rate per hour
- c) Budgeted OH = Budgeted hrs \* Standard OH rate per hour
- d) Actual OH = Actual hrs \* Actual OH rate per hour
- e) Revised Budgeted Hour = Actual Days \* Budgeted Hours per day  
(Expected hours for actual days worked)

When Calendar variance is asked then for capacity variance Budgeted Overhead is (Budgeted days \* Standard OH rate per day)

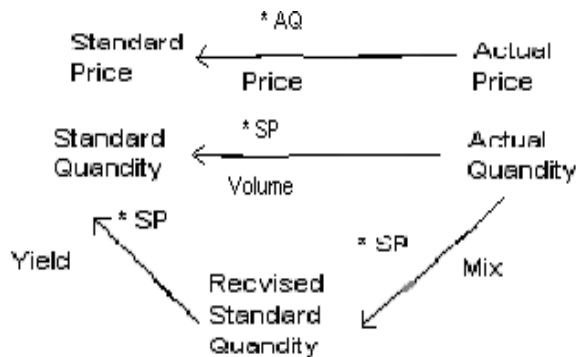


Revised Budgeted Hour (Budgeted hours for actual days) = Actual days \* Budgeted hours per day

Variable Overhead Variance : -

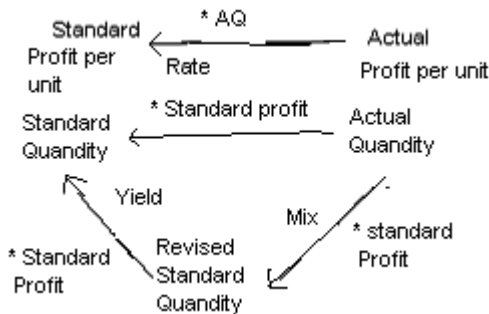


### Sales Value Variances : -



Sales value variance = Actual Sales – Budgeted Sales

### Sales Margin Variances : -



$$\begin{aligned} \text{Total sales margin variance} &= (\text{Actual Profit} - \text{Budgeted price}) \\ &= \{ \text{Actual quantity} * \text{Actual profit per unit} \} - \\ &\quad \{ \text{Budgeted quantity} * \text{Standard profit per unit} \} \end{aligned}$$

[Where :-

SC = Standard Cost,  
 SP = Standard Price,  
 AP = Actual Price,  
 AY = Actual Yield,  
 RSQ = Revised Standard Quantity,  
 ST = Standard Time  
 AT = Actual Time  
 BP = Budgeted Price,  
 RBT = Revised Budgeted Time  
 BMPU = Budgeted Margin per Unit  
 AMPU = Actual Margin per Unit

AC = Actual Cost  
 SQ = Standard Quantity  
 AQ = Actual Quantity  
 SY = Standard Yield  
 SR = Standard Rate,  
 AR = Actual Rate,  
 RST = Revised Standard Time,  
 BQ = Budgeted Quantity

Reconciliation:-

Reconciliation statement is prepared to reconcile the actual profit with the budgeted profit

Particulars	Favorable	Unfavorable	(Rs)
Budgeted Profit :			
Add Favorable variances			
Less Unfavorable variances			
Sales Variances :			
Sales price variance			
Sales mix variance			
Sales quantity variance			
<b>Cost variance :-</b>			



Material : Cost variance Usage variance Mix variance			
Labour : Rate variance Mix variance Efficiency variance Idle time variance			
Fixed overhead variance : Expenditure variance Efficiency variance			
Fixed overhead variance : Expenditure variance Efficiency variance Capacity variance Calendar variance			

### **NON-INTEGRATED ACCOUNTS**

Scheme of journal entries:-

Material:

a) For material purchases (cash or credit)

i) Material control a/c      Dr  
    To Cost ledger control a/c

ii) Stores ledger control a/c    Dr  
    To Material control a/c

- b) Purchases for a special job  
 Work-in-progress ledger control a/c Dr  
 To Cost ledger control a/c
- c) Material returned to vender  
 Cost ledger control a/c Dr  
 To Stores ledger control a/c
- d) Material (direct) issued to production  
 Work-in-progress control a/c Dr  
 To Stores ledger control a/c
- e) Material (indirect) issued to production  
 Manufacturing overheads a/c Dr  
 To Stores ledger control a/c
- f) Material returned from shop to stores  
 Stores ledger control a/c Dr  
 To Work-in-progress control a/c
- g) Material transferred from Job 1 to Job 2  
 Job 2 a/c Dr  
 To Job 1 a/c
- i) Material issued from stores for repairs  
 Manufacturing overhead a/c Dr  
 To Stores ledger control a/c

Labour:

- a) Direct wages paid
- i) Wage control a/c Dr  
 To Cost ledger control a/c
- ii) Work-in-progress a/c Dr  
 To Wage control a/c
- b) Indirect wages paid to workers in Production,  
 Administration, Selling and Distribution departments
- i) Wage control a/c Dr

To Cost ledger control a/c

- |                                     |    |
|-------------------------------------|----|
| ii) Production Overhead a/c         | Dr |
| Administrative Overhead a/c         | Dr |
| Selling & Distribution Overhead a/c | Dr |
| To Wage control a/c                 |    |
- c) Direct Expenses on a particular job
- |                            |    |
|----------------------------|----|
| Job a/c                    | Dr |
| To Cost ledger control a/c |    |

Overheads:-

- a) Overhead expenses incurred
- |                                     |    |
|-------------------------------------|----|
| Production overhead a/c             | Dr |
| Administrative Overhead a/c         | Dr |
| Selling & Distribution Overhead a/c | Dr |
| To cost ledger control a/c          |    |
- b) Carriage inward
- |                            |    |
|----------------------------|----|
| Manufacturing Overhead a/c | Dr |
| To Cost ledger control a/c |    |
- c) Production Overheads recovered
- |                              |    |
|------------------------------|----|
| Work-in-progress control a/c | Dr |
| To Production Overhead a/c   |    |
- d) Administrative Overhead recovered from finished goods
- |                                   |    |
|-----------------------------------|----|
| Finished goods ledger control a/c | Dr |
| To Administrative Overhead a/c    |    |
- e) Selling and Distribution Overhead recovered from sales
- |                               |    |
|-------------------------------|----|
| Cost of sales a/c             | Dr |
| To Selling & Distribution a/c |    |
- f) If over/under absorbed amounts are carried forward to subsequent year, the balance of each Overhead account will have to be transferred to respective Overhead suspense (or reserve) Accounts as follows:
- i) For over recovery :
- |                                     |    |
|-------------------------------------|----|
| Production Overhead a/c             | Dr |
| To Production overhead suspense a/c |    |

ii) For under recovery : Administrative Overhead Suspense a/c Dr  
 To Administrative Overhead a/c

Selling & Distribution Overhead Suspense a/c Dr  
 To Selling & Distribution Overhead a/c

g) In case the Under/Over absorbed overheads are transferred to costing profit & loss a/c then the relevant entries are:

i) For Over recovery: Production Overhead a/c Dr  
 To Costing Profit & Loss a/c

ii) For Under recovery: Costing Profit & Loss a/c Dr  
 To Administration Overhead a/c

### Sales:-

For sales effected: Cost ledger control a/c Dr  
 To Costing Profit & Loss a/c

### Profit / Loss:

a) In case of profit the entry is as follows  
 Costing Profit & Loss a/c Dr  
 To Cost ledger control a/c

b) Reverse the entry in case of loss

The main accounts which are usually prepared when a separate cost ledger is maintained is as follows:-

- i) Cost ledger control a/c
- ii) Stores ledger control a/c
- iii) Work-in-progress control a/c
- iv) Finished goods control a/c
- v) Wage control a/c
- vi) Manufacturing/Production/Works Overheads a/c
- vii) Administrative Overhead a/c
- Viii) Selling & Distribution Overhead a/c

- ix) Cost of sales a/c
- x) Costing profit & loss a/c

### **Transfer Pricing**

A transfer price is the amount of money that one unit of an organisation charges for goods and services to another unit of an organisation.

One of the key aspects here is that a transfer price is equivalent to an ordinary selling price and that any department or division that sets a transfer price is effectively selling its goods and services at a profit or a loss to another department or division within its organisation. Any part of an organisation using transfer pricing will be classed as a profit centre: since it is operating with a view to making a profit

(whether positive, profit, or negative, loss). If goods and services are transferred between departments and divisions at cost, then no profit or loss arises and the issue of transfer pricing does not, or should not, arise.

Organisations have a system of transfer pricing, therefore, in order to assess the efficiency and effectiveness of its department and divisional managers. This maybe in spite of the fact that transfer prices may be artificial in the sense that it is felt that there is no rationale for “selling” between departments and divisions.

Criteria for fixing Transfer Pricing:-

- i) External Capacity not fully utilized = Variable Cost
- ii) Capacity fully Utilized
  - a) If single product :-  
Selling Price (–) Selling Expenses
  - b) If multiple product  
Variable cost + Opportunity cost (measured on the basis of Product actually sacrificed)
- iii) If no market for Intermediate product  
Cost of supplying division of optimum level  
(–) Cost of the supplying division at previous output level.  
Difference in Output

(This would be equal to Variable cost when Fixed Cost is same at all levels)

Note:-

- i) Ignore Variable Selling expenses on Inter Department Transfer
- ii) In case of (ii) above If selling expenses is not given we have to assume some % as selling Expenses but it should not exceed 5% .

### Budgetary Control

Budget Ratios:-

- 1) Capacity usage Ratio  

$$= \frac{\text{Budgeted Hours}}{\text{Maximum possible working hours in budget period}} \times 100$$
- 2) Standard Capacity Employed Ratio

$$= \frac{\text{Actual Hours Worked}}{\text{Budgeted hours}} * 100$$

3) Level of Activity Ratio

$$= \frac{\text{Standard Hours for Actual Production}}{\text{Standard Hours for Budgeted Production}} * 100$$

4) Efficiency Ratio

$$= \frac{\text{Standard Hours for Actual Production}}{\text{Actual Hours}} * 100$$

5) Calendar Ratio

$$= \frac{\text{Actual Working days}}{\text{Budgeted working days}} * 100$$

### Zero Base Budgeting:

The name zero base budgeting derives from the idea that such budgets are developed from a zero base: that is, at the beginning of the budget development process, all budget headings have a value of ZERO. This is in sharp contrast to the incremental budgeting system in which in general a new budget tends to start with a balance at least equal to last year's total balance, or an estimate of it.

### Definition of Zero Base Budgeting (ZBB)

“A method of budgeting whereby all activities are reevaluated each time a budget is set. Discrete levels of each activity are valued and a combination chosen to match funds available”.

### Objectives and Benefits of ZBB

What zero base budgeting tries to achieve is an optimal allocation of resources that incremental and other budgeting systems probably cannot achieve. ZBB starts by asking managers to identify and justify their area(s) of work in terms of decision packages (qv).

An effective zero base budgeting system benefits organisations in several ways. It will

- Focus the budget process on a comprehensive analysis of objectives and needs
- Combine planning and budgeting into a single process
- Cause managers to evaluate in detail the cost effectiveness of their operations
- Expand management participation in planning and budgeting at all levels of the organisation

### **Activity Based costing**

In Traditional Method we split the Over Head incurred in production, based on machine hours which are not acceptable for many reasons.



In ABC method Over Head are splitted according to the related activity, for each type of Over Head. Overhead are apportioned among various Production cost centers on the basis of Activity cost drivers.

### **Relevant Costing - some theory**

#### **Introduction:** -

A management decision involves predictions of costs & revenues. Only the costs and revenues that will differ among alternative actions are relevant to the decision. The role of historical data is to aid the prediction of future data. But historical data may not be relevant to the management decision itself. Qualitative factors may be decisive in many cases, but to reduce the number of such factors to be judged, accountants usually try to express many decision factors as possible in quantitative terms.

#### **Meaning of Relevant Costs:** -

Relevant costs represent those future costs that will be changed by a particular decision. While irrelevant costs are those costs that will not be affected by a decision. In the short run, if the relevant revenues exceed the relevant costs then it will be worthwhile accepting the decision. Therefore relevant costs play a major role in the decision-making process of an organization. A particular cost can be relevant in one situation but irrelevant in another, the important point to note is that relevant costs represent those future costs that will be changed by a particular decision, while irrelevant costs are those costs that will not be affected by that decision. We shall now see what are relevant costs and revenues for decision-making process. In summary relevant information concerns:

#### **Other Important Terminologies :** -

Relevant costs are costs appropriate to aiding the making of specific management decisions. Actually, to affect a decision a cost must be:

**Future:** Past costs are irrelevant as they are not affected them by future decisions & decisions should be made as to what is best now.

**Incremental:** This refers to additional revenue or expenditure, which may appear as a result of our decision-making.

(A cash flow - Such charges as depreciation may be future but do not represent cash

flows and, as such, are not relevant.)

Sunk costs: Past costs, not relevant for decision making

Committed costs: This is future in nature but which arise from past decisions, perhaps as the result of a contract.

Relevant Costs: Problem areas:

1 Problems in determining the relevant costs of materials:

When considering various decisions, if the any materials required is not taken from existing stocks but would be purchased on a later date, then the estimated purchase price would be the relevant material cost. A more difficult problem arises when materials are taken from existing stock. In this situation the relevant cost of materials for a particular job (say job X) depends on

Material is in regular use of the company

Material is not in regular use of the company

Material is in short supply.

If the material is in regular use of the company then the material taken from existing stock requires replacement for the purpose of regular use therefore the relevant cost of material will be the Replacement cost.

If the material is not in regular use of the company the relevant cost of the materials depends on their alternative use. The alternative use of the materials will be either to sell them or to use them on other jobs. Hence the cost of using the materials results in an opportunity cost consisting of either

The net sales revenue if the materials were sold (or) The expense that would be avoided if the materials were used on some other job Whichever is greater.

If the material is in short supply the only way material for the job under consideration can be obtained is by reducing production of some other product / job. *This would release material for the order, but the reduced production* will result in loss of contribution which should be taken in to account when ascertaining the relevant costs for the specific order. Therefore the relevant cost will be Contribution lost (before the material cost, since the material cost will be incurred in any case) will be the relevant cost.

labour:

2 Determining the direct labour that are relevant to short - term decision depends on

the circumstances.

Where a company has temporary spare capacity and the labour force is to be maintained in the short - term, the direct labour cost incurred will remain same for all alternative decisions. The direct labour cost will therefore be irrelevant for short - term decision - making purposes.

However where casual labour is used and where workers can be hired on a daily basis; a company may then adjust the employment of labour to exactly the amount required to meet the production requirements. The labour cost will increase if the company accepts additional work, and will decrease if production is reduced. In this situation the labour cost be a relevant cost for decision - making purposes.

In a situation where full capacity exists and additional labour supplies are unavailable in the short - term, and where no further overtime working is possible, the only way that labour resources could then be obtained for a specific order would be to reduce existing production. *This would release labour for the order. but the reduced production* will result in loss of contribution, which should be taken in to account when ascertaining the relevant costs for the specific' order. Therefore the relevant cost will be Contribution lost (before the labour cost) will be the relevant cost.

### PROBLEMS

1. In a firm, material A has no alternative uses and 200 units of which lie in stock. The information below has been collected. You are required to find the relevant price of 120 units and 250 units respectively.

Book value

Current price

Sale price obtainable

Rs.2 per kg Rs.3 per kg Rs.2.80 per kg

2. Assume in the above problem the material is in regular use of the company

3. Assume in the above problem the material is in short 'supply and it is not possible to obtain the stock of material for some more time. At present the material is used in another product on which a contribution at the rate of Rs.1 O/unit is earned (after meeting the material cost). Each unit of the product requires 1 KG of Raw material A.

### Cash and fund flow statement

Rules for preparing schedule of changes in working capital :-

Increase in a current asset, results in increase in working capital – so Add  
 Decrease in current asset, results in decrease in working capital – so Decrease  
 Increase in current liability, results in decrease in working capital – so Decrease  
 Decrease in current liability results in increase in working capital – so Add

Funds from operations – Format

Particulars	Rs.	Rs.
Net profit		***
Add : Depreciation	***	
Goodwill written off	***	
Preliminary Exp. Written off	***	
Discount on share written off	***	
Transfer to General Reserve	***	
Provision for Taxation	***	
Provision for Dividend	***	
Loss on sale of asset	***	
Loss on revaluation of asset	***	***
		***
Less : Profit on sale of asset	***	
Profit on Revaluation of asset	***	***
Fund flow statement		***

Fund flow statement

Particulars	Rs.
Sources of funds : -	***
Issue of shares	***
Issue of Debentures	***
Long term borrowings	***
Sale of fixed assets	***
Operating profit	***
Total Sources	***
Application of funds : -	***
Redemption of Redeemable preference shares	***
Redemption of Debentures	***
Payment of other long term loans	***
Purchase of Fixed assets	***

Operating Loss	***
Payment of dividends, tax etc	***
Total Uses	***
Net Increase / Decrease in working capital (Total sources – Total uses)	***

### Cash flow statement

Cash From Operation : -

= Net profit	+ Decrease in Current Asset
	+ Increase in Current Liability
	- Increase in Current Asset
	- Decrease in Current Liability

### Cash flow statement

Sources	Rs.	Application	Rs.
Opening cash and bank balance	**	Opening Bank O/D	**
Issue of shares	**	Redemption of Preference Shares	**
Raising of long term loans	**	Redemption of Long term loans	**
Sales of fixed assets	**	Purchase of fixed assets	**
Short term Borrowings	**	Decrease in Deferred payment Liability	**
Cash Inflow	**	Cash Outflow	**
Closing Bank O/D	**	Tax paid	**
		Dividend paid	**
		Decrease in Unsecured loans, Deposits	**
		Closing cash and bank balance	**
	**		**

## Ratio Analysis

A) Cash Position Ratio :-

$$1) \text{ Absolute Cash Ratio} = \frac{\text{Cash Reservoir}}{\text{Current Liabilities}}$$

$$2) \text{ Cash Position to Total asset Ratio} = \frac{\text{Cash Reservoir}}{\text{Total Assets}} * 100$$

(Measure liquid layer of assets)

$$3) \text{ Interval measure} = \frac{\text{Cash Reservoir}}{\text{Average daily cash expenses}}$$

(ability of cash reservoir to meet cash expenses) ( Answer in days)

Notes :-

- Cash Reservoir = Cash in hand + Bank + Marketable Non trade investment at market value.
- Current liabilities = Creditors + Bills Payable + Outstanding Expenses + Provision for tax (Net of advance tax) + Proposed dividend + Other provisions.
- Total assets = Total in asset side – Miscellaneous expenses – Preliminary expenses + Any increase in value of marketable non trading Investments.
- Average cash expenses = Total expenses in debit side of P & L a/c – Non cash item such as depreciation, goodwill, preliminary expenses written off, loss on sale of investments, fixed assets written off + advance tax (Ignore provision for tax) . The net amount is divided by 365 to arrive average expenses.

Remarks :- In Comparison

- When absolute cash ratio is lower then current liability is higher
- When cash position to Total Asset ratio is lower then the total asset is relatively higher.
- When cash interval is lower the company maintain low cash position. It is not good to maintain too low cash position or too high cash position.

B) Liquidity Ratio :-

$$1) \text{ Current ratio} = \frac{\text{Current asset}}{\text{Current Liability}}$$

$$2) \text{ Quick ratio or Acid Test ratio} = \frac{\text{Quick Asset}}{\text{Quick liability}}$$

Notes :-

- Quick Asset = Current Asset – Stock
- Quick Liability = Current liability – Cash credit, Bank borrowings, OD and other Short term Borrowings.
- Secured loan is a current liability and also come under cash credit
- Sundry debtors considered doubtful should not be taken as quick asset.
- Creditors for capital WIP is to be excluded from current liability.
- Current asset can include only marketable securities.
- Loans to employees in asset side are long term in nature and are not part of current assets.
- Provision for gratuity is not a current liability.
- Gratuity fund investment is not a part of marketable securities.
- Trade investments are not part of marketable securities.

Remarks :-

- Higher the current ratios better the liquidity position.

C) Capital structure ratios :-

$$1) \text{ Debt equity ratio} = \frac{\text{Debt}}{\text{Equity}} = \frac{\text{External Equity}}{\text{Internal Equity}}$$

$$\text{(or) Leverage ratio} = \frac{\text{Long term debt}}{\text{Long term fund}} = \frac{\text{Share holders fund}}{\text{Long term fund}}$$

$$2) \text{ Proprietary ratio} = \frac{\text{Proprietary fund}}{\text{Total Assets}}$$

$$3) \text{ Total Liability to Net worth ratio} = \frac{\text{Total Liabilities}}{\text{Net worth}}$$

$$4) \text{ Capital gearing ratio} = \frac{\text{Preference share capital} + \text{Debt}}{\text{Equity} - \text{Preference share capital}}$$

Notes :-

- Share holders fund (or) Equity (or) Proprietary fund (or) Owners fund (or) Net worth = Equity share + Preference share + Reserves and surplus – P & L a/c – Preliminary Expenses.

- Debt (or) Long term liability (or) Long term loan fund = Secured loan (excluding cash credit) + unsecured loan + Debentures.
- Total asset = Total assets as per Balance sheet – Preliminary expenses.
- Total liability = Long term liability + Current liability (or) short term liability
- Long term fund = Total asset – Current liability = Share holders fund + long term loan fund.

Remarks : -

- In debt equity ratio higher the debt fund used in capital structure, greater is the risk.
- In debt equity ratio, operates favorable when if rate of interest is lower than the return on capital employed.
- In total liability to Net worth Ratio = Lower the ratio, better is solvency position of business, Higher the ratio lower is its solvency position.
- If debt equity ratio is comparatively higher then the financial strength is better.

D) Profitability Ratio : -

$$1) \text{ Gross Profit Ratio} = \frac{\text{Gross Profit}}{\text{Sales}} * 100$$

$$2) \text{ Net Profit Ratio} = \frac{\text{Net Profit}}{\text{Sales}} * 100$$

$$3) \text{ Operating Profit ratio} = \frac{\text{Operating profit}}{\text{Sales}} * 100$$

$$4) \text{ Return to shareholders} = \frac{\text{Net profit after interest and tax}}{\text{Share holders fund}}$$

$$5) \text{ Return on Net Worth} = \frac{\text{Return on Net worth}}{\text{Net worth}} * 100$$

$$6) \text{ Return on capital employed (or) Return on investment} = \frac{\text{Return (EBIT)}}{\text{Capital Employed}}$$

7) Expenses Ratios :-

a) Direct expenses Ratios : -

$$i) \text{ Raw material consumed} * 100$$



$$\begin{aligned} & \text{Sales} \\ \text{ii) } & \frac{\text{Wages}}{\text{Sales}} * 100 \\ \text{iii) } & \frac{\text{Production Expenses}}{\text{Sales}} * 100 \end{aligned}$$

b) Indirect expenses Ratios : -

$$\begin{aligned} \text{i) } & \frac{\text{Administrative Expenses}}{\text{Sales}} * 100 \\ \text{ii) } & \frac{\text{Selling Expenses}}{\text{Sales}} * 100 \\ \text{iii) } & \frac{\text{Distribution Expenses}}{\text{Sales}} * 100 \\ \text{iv) } & \frac{\text{Finance Charge}}{\text{Sales}} * 100 \end{aligned}$$

Notes : -

- In the above the term “term” is used for business engaged in sale of goods, for other enterprises the word “revenue” can be used.
- Gross profit = Sales – Cost of goods sold
- Operating profit = Sales – Cost of sales  
= Profit after operating expenses but before Interest and tax.
- Operating Expenses = Administration Expenses + Selling and distribution expenses, Interest on short term loans etc.
- Return = Earning before Interest and Tax  
= Operating profit  
= Net profit + Non operating expenses – Non operating Income
- Capital employed = Share holders fund + Long term borrowings  
= Fixed assets + Working capital
- If opening and closing balance is given then average capital employed can be substituted in case of capital employed which is  
$$\frac{\text{Opening capital employed} + \text{Closing capital employed}}{2}$$

E) Debt service coverage ratios =  $\frac{\text{Profit available for debt servicing}}{\text{Loan Installments} + \text{Interest}}$

Notes : -

- Profit available for debt servicing = Net profit after tax provision + Depreciation + Other non cash charges + Interest on debt.

Remarks : -

- Higher the debt servicing ratio is an indicator of better credit rating of the company.
- It is an indicator of the ability of a business enterprise to pay off current installments and interest out of profits.

F) Turnover Ratios: -

$$1) \text{ Assets turnover} = \frac{\text{Sales}}{\text{Total assets}}$$

$$2) \text{ Fixed assets turnover} = \frac{\text{Sales}}{\text{Fixed assets}} \quad [\text{Number of times fixed assets has turned into sales}]$$

$$3) \text{ Working capital turnover} = \frac{\text{Sales}}{\text{Working capital}}$$

$$4) \text{ Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}} \quad (\text{for finished goods})$$

$$5) \text{ Debtors turnover (or) Average collection period} = \frac{\text{Credit sales}}{\text{Average accounts receivable}} \quad (\text{in ratio})$$

$$(\text{or}) = \frac{\text{Average accounts receivable}}{\text{Credit sales}} * 365 \quad (\text{in days})$$

$$6) \text{ Creditors turnover (or) Average payment period} = \frac{\text{Credit purchases}}{\text{Average accounts payable}} \quad (\text{in ratio})$$

$$(\text{or}) = \frac{\text{Average accounts Payable}}{\text{Credit Purchases}} * 365 \quad (\text{in days})$$

$$7) \text{ Inventory Turnover (for WIP)} = \frac{\text{Cost of production}}{\text{Average Inventory (for WIP)}}$$

$$8) \text{ Inventory Turnover (for Raw material)} = \frac{\text{Raw material consumed}}{\text{Average inventory (for raw material)}}$$

$$10) \text{ Inventory Holding Period} = \frac{365}{\text{Inventory turnover ratio}}$$

$$11) \text{ Capital Turnover ratio} = \frac{\text{Cost of sales}}{\text{Capital employed}}$$

Note : -

- Working capital = Current asset – Current liability  
= 0.25 \* Proprietary ratio
- Accounts Receivable = Debtors + Bills receivable
- Accounts payable = Creditors + Bills Payable

Remarks : -

- If assets turnover ratio is more than 1, then profitability based on capital employed is profitability based on sales.
- Higher inventory turnover is an indicator of efficient inventory movement. It is an indicator of inventory management policies.
- Low inventory holding period lower working capital locking, but too low is not safe.
- Higher the debtors turnover, lower the credit period offered to customers. It is an indicator of credit management policies.
- Higher the creditors turnover, lower the credit period offered by suppliers.

G) Other Ratios: -

$$1) \text{ Operating profit ratio} = \text{Net profit ratio} + \text{Non operating loss / Sales ratio}$$

$$2) \text{ Gross profit ratio} = \text{Operating profit ratio} + \text{Indirect expenses ratio}$$

$$3) \text{ Cost of goods sold / Sales ratio} = 100\% - \text{Gross profit ratio}$$

$$4) \text{ Earnings per share} = \frac{\text{Net profit after interest and tax}}{\text{Number of equity shares}}$$

$$5) \text{ Price earning ratio} = \frac{\text{Market price per equity share}}{\text{Earning per share}}$$

$$6) \text{ Pay out ratio} = \frac{\text{Dividend per equity share}}{\text{Earning per equity shares}} * 100$$

$$7) \text{ Dividend yield ratio} = \frac{\text{Dividend per share}}{\text{Market price per share}} * 100$$

$$8) \text{ Fixed charges coverage ratio} = \frac{\text{Net profit before interest and tax}}{\text{Fixed charges}}$$

## Interest charges

$$9) \text{ Interest coverage ratio} = \frac{\text{Earning before interest and tax}}{\text{Interest charges}}$$

$$10) \text{ Fixed dividend coverage ratio} = \frac{\text{Net profit}}{\text{Annual Preference dividend}}$$

$$11) \text{ Over all profitability ratio} = \frac{\text{Operating profit}}{\text{Capital employed}} * 100$$

$$12) \text{ Productivity of assets employed} = \frac{\text{Net profit}}{\text{Total tangible asset}}$$

$$13) \text{ Retained earning ratio} = \frac{\text{Retained earnings}}{\text{Total earnings}} * 100$$

H) General Remarks: -

- Fall in quick ratio when compared with last year or other company is due to huge stock piling up.
- If current ratio and liquidity ratio increases then the liquidity position of the company has been increased.
- If debt equity ratio increases over a period of time or is greater when comparing two ratios, then the dependence of the company in borrowed funds has increased.
- Direct expenses ratio increases in comparison then the profitability decreases.
- If there is wages / Sales ratio increases, then this is to verified
  - a) Wage rate
  - b) Output / Labour rate
- Increment in wage rate may be due to increased rate or fall in labour efficiency.
- Again there are many reasons for fall in labour productivity namely abnormal idle time due to machine failure, power cut etc.
- Reduction in Raw material consumed / sales ratio may be due to reduction in wastage or fall in material price.
- Increase in production expenses ratio may also be due to price raise.
- Stock turnover ratio denotes how many days we are holding stock.
- In stock turnover ratio greater the number of days, the movement of goods will be on the lower side.

- Financial ratios are Current ratio, Quick ratio, Debt equity ratio, Proprietary ratio, Fixed asset ratio.
- Short term solvency ratios are current ratio, Liquidity ratio
- Long term solvency or testing solvency of the company ratios are Debt equity ratio, fixed asset ratio, fixed charges coverage ratio (or) Interest coverage ratio.
- To compute financial position of the business ratios to be calculated are – current ratio, Debt equity ratio, Proprietary ratio, fixed asset ratio.
- Fictitious asset are Preliminary expenses, Discount on issue of shares and debentures, Profit and loss account debit balance.

### Assignment

- 1) Basis of Technique used is minimization Technique
- 2) It can also be done in maximation Technique
- 3) Various steps in Assignment Problem are

Step 1: Check whether the problem is balanced or unbalanced by checking whether row is equal to column, if unbalanced add dummy column or row to balance the problem

Step 2: Identify Least Number in each row and subtract with all number in that Row.

Step 3: Identify least number of each column and subtract with all number in that column.

Step 4: Check whether solution is reached with zero selection in one row and column, ie. Cover all the zero with minimum number of lines, solution is reached only when selected zeros is equal to number of rows or columns or number of lines is equal to order of matrix.

Step 5: If solution is not reached so maximum sticking

Step 6: Select the least element in within the unstriked Element

Step 7: The element selected above is

- i) Subtracted with all the unstriked element

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- ii) Added to all the double striped element (Intersection of two lines)

Step 8: Check the solution

Step 9: If solution is not reached continue with the process from step 5.

### Linear Programming

Simplex Method:-

Steps:-

1. Determine the objective function Z. Objective may be maximization or minimization.
2. For maximation problem the constraints would be  $\leq$  sign.  
For minimization problem the constraints would be  $\geq$  sign.
3. Introduce slack variable  
For  $\leq$  sign – add the slack variable ie. Add S1  
For  $\geq$  sign – subtract the slack variable and add artificial variable  
ie. Subtract S1, add A1.
4. Change the Objective function  
For S1 – Add ‘0S1’  
For A1 – Add ‘MA1’

5.  
table

		C <sub>j</sub>						
Quantity	Variable	Const.	X	Y	Z	S1	S2	RR
	S1							
	S2							
		Z <sub>j</sub>						
		C <sub>j</sub> - Z <sub>j</sub>						

Simplex  
format:-

6.  $Z_j$  is arrived by summation of constant column with X,Y,Z columns
7. Criteria for selecting the key column :-  
 For Maximization Problem – Highest value of  $C_j - Z_j$   
 For Minimization Problem – Lowest Value of  $C_j - Z_j$
8. Divide the Quantity Column with Key column to arrive at RR
9. Criteria for Selecting the Key row :-  
 For Maximization & Minimization Problem – Lowest Positive RR is selected
10. The Meeting Point is key Element
11. Criteria for deciding the optimal solution  
 For Maximization Problem – All elements in  $C_j - Z_j$  row is negative or zero.  
 For Minimization Problem – All elements in  $C_j - Z_j$  row is positive or zero  
  
 Note – For finding whether all the elements in  $C_j - Z_j$  row is positive or zero for minimization problem substitute all the 'M' with highest value.
12. If solution is not reached next table is formed.
13. Input for next table is  
 First key row in the next table is filled by dividing all the numbers in the key row of the previous table with the key element.  
 Remaining all the rows is arrived as follows: -  
 Corresponding previous Table row element (Value relating to that row in the key column) \* Corresponding element in key row in the 2<sup>nd</sup> table as filled in previous step)
14. Check the optimal solution, if not reached form the third table.
15. If solution is reached then answer is amount in quantity column corresponding to the variable.

Other Points : -

- We can convert the Minimization Problem into Maximation Problem. This is known as duality.
- We can change the  $\geq$  sign to  $\leq$  sign to match the problem  
E.g.  $X + Y \leq 100$   
is converted into  $-X - Y \geq -100$

### Transportation

- The procedure followed is Minimization Procedure
- Problem is generally solved in Vogel's Approximation Method(VAM)
- Steps for the problem is : -
  1. Convert profit matrix into loss matrix.
  2. Balance the problem.
  3. Arrive at Row penalty and column penalty  
Row penalty and column penalty is calculated at (2<sup>nd</sup> least – 1<sup>st</sup> least) in the corresponding row or column.
  4. Select from the entire Row penalty and column penalty maximum number.
  5. From the entire Row or Column minimum is selected.
  6. Strike the row or column which gets eliminated.
  7. Continue until the entire item in the table is strike.
  8. Write separately Initial solution table.



9. Check for Degeneracy. Degeneracy occurs when all the elements in the initial solution is equal to  $(\text{Row} + \text{column} - 1)$
10. If degeneracy occurs introduce epsilon – ‘e’. ‘e’ is introduced in least independent cell.
11. Form UV Matrix. It is formed by the element in the original solution corresponding to the element in the Initial solution.
12. Find unalloted elements in the UV Matrix
13. Find  $\Delta I_j$  i.e.(Original Matrix element – Unalloted element found above)
14. Check for optimal solution ie. All items must be zero or positive.
15. If not reached select the maximum negative in  $\Delta I_j$  matrix.
16. Form a loop and reallocate the solution.
17. Repeat from step 9.

Notes: -

1. If there is zero in  $\Delta I_j$  matrix while arriving at optimal solution then there is another solution for the problem.
2. Dummy column can be introduced in profit or loss matrix.
3. If there is penalty/redundancy payment for unsatisfying demand etc. is given then fills the dummy row or column with that amount or fill it with zeros.
4. If there is constraint in the problem first satisfy the constraint and then solve.
5. various other methods for solving the problem is
  - Least cost method
  - North west corner rule
6. Generally VAM method is used

### Network Analysis (CPM/PERT)

#### CPM

- Total float =  $LS - ES$  (or)  $LF - EF$
- Free float = Total float – Head event slack
- Independent float = Free float – Tail event slack
- In the diagram  $Es = Lf$  in the critical path
- Critical path is the longest duration
- To find the minimum time associated cost (i.e. Additional cost incurred per unit of time saved) following formula is used :-  
Crash cost per day (or) Activity cost supply  
=  $\frac{\text{Crash cost} - \text{Normal cost}}{\text{Normal time} - \text{Crash time}}$
- Interfacing float = It is the part of the total float which causes reduction in the float of the succession activities. In other words it is the portion of activity

float which cannot be continued without affecting adversely the float of the subsequent activity or activities.

- Steps in proceeding the problem : -
2. First find and fill the ES and LF column from the diagram.
  3. Then find LS and EF as follows :-  

$$Ls = Lf - \text{Duration}$$

$$Ef = Es + \text{Duration}$$
  4. Find total float
  5. Find free float. Wherever total float column has zero free float column is also taken has zero and remaining elements is filled as said above
  6. Find Independent float. Wherever free float column has zero Independent float column is also taken has zero and remaining elements is filled as said above

Notes: -

1. ES = Earliest Start. Indicates earliest time that the given activity can be scheduled
2. EF = Earliest Finish. Time by which the activity can be completed at the earliest.
3. LF = Latest Finish. Latest allowable occurrence time of the head event of the activity.
4. LS = Latest Start.
5. Total duration of the critical path is the maximum time/amount consumed for the activity. This should be crashed with respect to crashing days and crashing cost. This crashing should not change the critical path.

**PERT** : -

- Expected (or) Average time is found by assigning weights as follows : -  
     1 for optimistic  
     4 for Most likely

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1 for pessimistic

$$\text{Average time} = \frac{1 \text{ optimistic} + 4 \text{ most likely} + 1 \text{ pessimistic}}{6}$$

- Standard Deviation =  $\frac{\Sigma (\text{Pessimistic time} - \text{Optimistic time})}{6}$
- Variance = (Standard Deviation)<sup>2</sup>
- Probability of completing the project in N days  
 =  $\frac{\text{Required time(N)} (-) \text{ Expected time (critical path duration)}}{\text{Standard Deviation}}$   
 [Nothing but  $Z = (X - \text{Mean}) / \text{Standard deviation}$ ]  
 = Y (say)  
 = Find Z(y)  
 = Probability %
  - If required time > Expected time then =  $0.5 + Z(Y)$
  - If required time < Expected time then =  $0.5 - Z(Y)$

### Learning Curve

Learning is the process of acquiring skill, Knowledge, and ability by an individual. According to learning curve theory the productivity of the worker increases with increase in experience due to learning effect. The learning theory suggests that the best way to master a task is to “learn by doing”. In other words, as people gain experience with a particular job or project they can produce each unit more efficiently than the preceding one.

The speeding up of a job with repeated performance is known as the learning effect or learning curve effect.

The cumulative average time per unit produced is assumed to fall by a constant percentage every time the total output is doubled. So generally learning effect is found in the multiples of 2. If learning curve effect is asked between two even numbers then Learning curve equation is formed ie. Learning curve effect is expressed mathematically as follows:

Learning curve equation =

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$Y = a(x)^{-b}$  Where Y = Average time per unit  
 a = Total time for first unit  
 x = Cumulative number of units manufactured  
 b = the learning curve index

Learning curve index (b) =  $\frac{\log(1 - \% \text{ decrease})}{\log 2}$

## Management Accounting and Financial Analysis

### International Financial Management

1. Direct Quote (eg) 1\$ = Rs.49
2. Indirect Quote (eg) Rs.1 = .0204\$
3. TT Rate = Telegraphic Transfer Rate
4. TOM Rate = Tomorrow Rate
5. Spot Rate = Today's rate. Normally it will be 3<sup>rd</sup> day rate from TT Rate.

Direct Quote is used in all country except UK where indirect quote is used.

Offer Rate = Selling Rate

Spread Rate = Offer Rate – Bid Rate

$$\text{Spread Rate (\%)} = \frac{\text{Offer Rate} - \text{Bid Rate}}{\text{Offer Rate}} * 100 \quad (111^{\text{tr}} \text{ to that of NP Ratio})$$

Swap points is ascending stage it is at premium. If it is descending stage it is at discount.

If it is said as INR/\$ then the meaning is

- Numerator factor = Local Currency = INR
- Denominator factor = Foreign Currency = \$

Forward Quotation (%) (I.e. Premium/Discount expressed at annualized %)

$$= \frac{\text{Forward Rate} - \text{Spot Rate}}{\text{Spot Rate}} * \frac{12}{n} * 100 \quad (\text{in months})$$

$$= \frac{\text{Forward Rate} - \text{Spot Rate}}{\text{Spot Rate}} * \frac{365}{n} * 100 \quad (\text{in days})$$

If the quote is direct or Indirect is to be found and the relation is with £ (pound) both direct and Indirect quote is to be said.

$$\text{Maturity Value} = P (1+r)^n$$

Interest Rate Parity:

- i) Domestic Rate < Foreign Rate  $\pm$  Forward Premium / Discount  
(In this case invest in foreign currency)
- ii) Domestic Rate > Foreign Rate  $\pm$  Forward Premium / Discount  
(In this case invest in Domestic Currency)

Forward Rate: It is rate negotiated for the delivery to be made / taken on a future date for present transaction.

Future spot rate: It is actual rate prevailing on the agreed future date.

Other points:-

- Currency country which has less Interest rate will have forward rate at premium and vice versa
- If two rates ie. 20.23 / 35 is given then highest rate is offer rate, lowest rate is bid rate.
- If INR / DG is given and we have to DG / INR then it is 1 / (INR / DG)

- $1 / (\text{Bid Rate}) = \text{Offer Rate}$ .
- $1 / (\text{Offer Rate}) = \text{Bid Rate}$ .

Interest rate swap: - Generally interest rate differs from company to company because of their grade (reputation) and rates can be fixed rates or floating rate. If there is 2 company under different grade and different fixed / floating rate can gain advantage by reducing their interest rate by “Interest rate swap”.

In this if ‘Company A’ wants to borrow at floating rate and ‘Company B’ wants to borrow and fixed rate, then interest rate swap is applied by which company A borrows at floating Rate of company B and company B borrows at fixed rate of company A. By this swap one company gains and other company losses. Net gain is split between two companies so that the two companies benefit by paying lower interest rate for their borrowing.

To look at the problem quickly the theory followed in “Difference in fixed rate interest of two companies is profit” and “Difference in floating rate interest of two companies is loss”. Then net gain / loss are found.

## **Capital Budgeting**

Process of Capital Budgeting:

- Huge cash outlay.
- Decision taken is irrevocable.
- Invest in lumpsum the receipt is piecemeal
- Wrong decision will affect the very base of the company.

Capital Budgeting Rules:

- Ignore accounting profit and take only cash flows.
- Try only incremental basis ignore Average calculation.
- Consider all incidental effects.

- Ignore sunk cost (ie. Cost remain unaltered for various alternatives available is sunk cost)
- Consider opportunity cost (Opportunity Loss is Opportunity cost)
- Beware of allocated cost – Ignore them
- Depreciation is an important cash flow when taxation is considered. If no taxation, no depreciation.
- Interest should not be considered as part of the cost, in the arrival of cash inflow for investing decision problems. If deducted add back post tax interest.
- Separate investing decision and financing decision.
- Be consistent with inflation rates. All future cash flows is assumed as without inflation. Such cash flows are referred as real cash flows.
- Cash flows under the influence of inflation would be referred to as money cash flows. (Money cash flows (or) Nominal Cash Flows (or) Market cash flows)
- Unless otherwise stated cost of capital is considered after tax basis because cash flows will be considered only on after tax basis. (PV factor is the inverse of compounding factor)
- Equation to find out the PV of an amount if cost of capital and Inflation rate is given

$$(1 + \text{Money Rate}) = (1 + \text{Real Discount rate}) * (1 + \text{Inflation Rate})$$

#### Method of evaluating Capital Budgeting:

1. Pay back method
2. Annual Rate of Return
3. Discounted cash flow
  - Net Present Value (NPV)
  - Internal Rate of Return (IRR)
  - Profitability Index (PI) (or) Benefit cost Ratio
  - Equated Annuity Cost (EAC) (or)  
Equated Annuity Benefit (EAB)
  - Discounted Pay Back (or) Time adjusted BEP

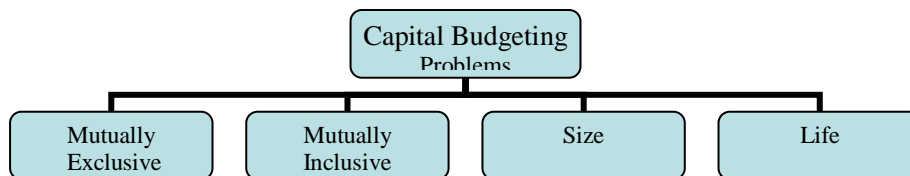
	Expressed In	Bench mark (Basis of Selection)	Formula	When to use
Pay Back Period	Years	Shortest	Recovery time of investment	When no cost of capital is given
Annual Rate Of Return	%	Highest	1) AR / II 2) AR / AI	When no cost of capital is given
NPV	Rs.	Greatest	Discounted CI	When two projects is



		Value	- Discounted CO	same in all aspects ie. No disparity
IRR	%	Highest	At this rate Discounted CI = Discounted CO and NPV = 1, PI = 1	Rarely used in finding Cost of Capital.
Profitability Index (PI)	Points	Highest	$\frac{\text{Discounted CI}}{\text{Discounted CO}}$	Size Disparity
EAC (or) EAB	Rs.	EAC = Lowest EAB = Highest	EAC = $\frac{\text{Discounted CO}}{\text{PV Factor}}$ EAB = 1) $\frac{\text{Discounted CI}}{\text{Annuity Factor}}$ 2) $\frac{\text{NPV}}{\text{PV Factor}}$	Life Disparity
Discounted Pay Back	Years	Shortest	Recovery time of Investment	Break even time

Where: - AI = Average Investment  
AF = Annuity Factor  
II = Initial Investment

CI = Cash Inflow  
CO = Cash Outflow



Internal Rate of Return (IRR):-

IRR otherwise called as yield on investment, Marginal efficiency of capital, Marginal productivity of capital, Rate of Return, Time adjusted rate of return.

Discounting +  $\frac{\text{Difference calculated in present value and required cash outlay}}{\text{Factor}}$   
Difference in calculated present values  
\* Difference in Rate

To approximately locate the factor in which the amount returns

$F = I / C$  Where F = Factor to be located

I = Original Investment

C = Average Cash Inflows per year

In the PV table year column must be seen to trace the nearest fake annuity. Year column is the year of economic life of machine.

Notes: - If actual cash flow is higher than average cash flows in the initial years then increase the fake IRR point a few % upward. If it is lower in the initial years then decrease the percentage few points lower to find fake IRR

If discount rates are not known but cash inflows and outflows are known then IRR is calculated as  $I = R / (1+r)$

Where I = Cash outflow (or) Initial Investment

R = Cash inflow

R = Rate of return yielded by the Investment (or IRR)

Calculating Discounting Factor:-

$$1 / (1+rate)^n \quad \text{Where } n = \text{Years}$$

Method of ranking projects:-

Desirability factor (Profitability Index) vs. NPV Method vs. IRR

Selection of projects out of two mutually exclusive projects having same funds at disposal then NPV method is preferred.

In IRR Method the presumption intermediate cash inflows are reinvested at same rate i.e. IRR. But in NPV method it is reinvested at cut off rate.

Reinvestment at cut off rate is more possible than IRR. Hence Net Present Values being obtained from discounting at a fixed cut off rate are more reliable in ranking 2 or more projects than IRR.

Models of Risk Analysis:-

i) Hiller's Model: He takes into account mean of present value of the cash flows and the SD of such cash flows.

$$\overline{M} = \sum_{i=0}^n (1+r)^{-i} m_i \quad (\text{used to determine the present value of mean})$$

$$\sigma^2 = \sum_{i=0}^n (1+r)^{-2i} * \sigma_i^2 \quad (\text{Used to find the present value of variance})$$

Where  $m_i$  = Mean of cash flow in the  $i^{\text{th}}$  period – expected cash flow for year  $i$

$\sigma_i^2$  = Variance in the  $i^{\text{th}}$  period.

$\frac{r}{1+r}$  = Discounting Factor

$\overline{M}$  = Total of Present value of mean

$\sigma^2 =$  Total of present value of variance  
 Bench mark = Project with lower SD will be preferred.

1) Real Cash flows restated in terms of nominal cash flows as follows:-  
 $(1 + \text{inflation rate}) * \text{Real cash flows}$   
 After this discounting cash flow is applied to find NPV.

2) Converting nominal discounting rate into real terms  

$$\text{Real discount rate} = \frac{1 + \text{Nominal discount rate}}{1 + \text{inflation rate}} - 1$$
  
 With this real discount rate the Cash Inflows are discounted to find NPV.

3) Pay back reciprocal  

$$= \frac{\text{Average annual cash inflows}}{\text{Initial Investment}} \quad (\text{It is used for reasonable approximation of IRR})$$

4) The formula for deflation is  

$$\frac{\text{Index Number at the beginning}}{\text{Index Number at the end}} * \text{Cash Inflows}$$
  
 (or)  $\text{Cash Inflows} / (1 + \text{Inflation Rate})^n$

Note: If in a problem Real cash flows are given and Inflation Rate and Cost of Capital is given then

- i) Convert Real Cash Flows into Normal Cash Flows by using formulae said in (1) above.
- ii) Adjust for Depreciation and tax and find Cash Flow after Tax before Depreciation.
- iii) Deflate the amount arrived above by using formulae said in (4).
- iv) With the amount arrived above find NPV using COC.

Summary:-

- i) Risk Adjusted Discount rate approach  
 = NPV for CFAT at Risk adjusted Discount Rate.
- ii) Certainty Equivalent Approach  
 = NPV for (Certainty Equivalent Coefficient \* CFAT) at Risk less Interest rate.
- iii) Probality Discount approach  
 = NPV for (CF) at risk less Interest rate.

### **Analysis of Risk and Uncertainty**

- 1) Sensitivity Analysis: - It provides different cash flow estimates under 3 assumptions
- a. worst
  - b. The expected (Most likely)
  - c. The best.

NPV is found under these three assumptions and decision is taken.

- 2) Precise measure of risk:-

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a) Standard deviation: - Absolute measure of risk.

$$\sigma = \sqrt{\sum_{i=1}^n P_i (CF - \overline{CF})^2}$$

CF = Cash flow      i = Year

$\overline{CF}$  = Mean cash flow (CF of particular projects total divided by number of CF)  
 $= \sum CF * P$

P = Probability

b) Variance =  $(\sigma)^2 = \sum_{i=1}^n P_i (CF - \overline{CF})^2$

c) Co - Variance (a,b) =  $P_i (CF_a - \overline{CF_a}) (CF_b - \overline{CF_b})$

d) Coefficient of correlation of two variable factor =  $\frac{\text{Co - Variance (a,b)}}{\sigma_a \sigma_b}$

e) Return of portfolio =  $W_a * R_a + W_b * R_b$  Where W - Proportion invested  
R - Return

f) Risk of portfolio =  $\sqrt{P_a^2 * \sigma_a^2 + P_b^2 * \sigma_b^2 + 2P_a * P_b * \sigma_a * \sigma_b * \text{Cor(a,b)}}$

g) Co - Efficient of variation = A relative measure of risk.

$$V = \frac{\text{Standard Deviation}}{\text{Expected cash flow (or) mean (or) CF}} \quad \text{(or) } \frac{\sigma}{\overline{NPV}}$$

$$\overline{NPV} = NPV * \text{Probability}$$

h) Risk adjusted discount rate approach: - In this risk adjusted discount rate is taken as PV factor and calculated as NPV method.

$$= \sum \frac{(CFAT)_t}{(1 + K_r)^t} - CO \quad \text{Where } K_r = \text{Risk adjusted discount rate}$$

i) Certainty Equivalent (CE) approach =  $\frac{\text{Risk less Cash Flow}}{\text{Risky Cash Flow}}$

j) If Correlation Coefficient [Cor(a,b)] is

$\text{Cor(a,b)}$	$\frac{\sigma_p}{\sigma_a \sigma_b}$
+1	$(P_a * \sigma_a) + (P_b * \sigma_b)$ [ie. If it is perfectly positively correlated]
-1	$(P_a * \sigma_a) - (P_b * \sigma_b)$ [ie. If it is perfectly negatively correlated]

0 Above  $\sigma_p$  formula will apply

k) Probability Distribution approach: -

$$\sigma_t (\text{SD of CF}) = \sqrt{\sum p (\text{CF} - \overline{\text{CF}})^2} = \sum \frac{\overline{\text{CF}}}{(1+i)^t} - \text{CO} = \text{NPV}$$

Where

CF = Cash Flow  $\overline{\text{CF}}$  = Mean i.e. Total of cash flow multiplied by probability for the period (or) expected value for CFAT in period t)

i = Risk less rate of interest.

$\sigma_t$  = SD for period t (SD for particular period)

l) SD for the probability distribution of NPV is (ie. SD of CF)

$$\sigma (\text{NPV}) = \sqrt{\sum (\sigma_t^2) / (1+i)^{2t}} \quad (\text{this is used for uncorrelated CF})$$

$$\sigma (\text{NPV}) = \sum (\sigma_t) / (1+i)^t \quad (\text{used for perfectly correlated CF})$$

Where I = Rate of Return.

m) Optimum proportion at which risk is minimum =  $X_a = \frac{\sigma_b}{\sigma_a + \sigma_b}$   
(or)  $\sigma_a X - \sigma_b (1-X) = 0$

NPV for the period is calculated by taking CF as CF for respective period and calculated normally

Note:-

i) In certainty Equivalent approach rate of discount is the risk less rate of Interest as the risk is adjusted with CFAT.

ii) In this case CFAT is multiplied with certainty equivalent and PV is calculated by risk less rate of interest.

iii) If projects are ranked with respect of risk and return. Project with respect to risk requires  $\sum \overline{\text{NPV}}$  (i.e.  $\sum (\text{NPV} * \text{Probability})$ ) and the project with respect to return find co-efficient of variation =  $\sigma / \sum \overline{\text{NPV}}$

iv) Probability that NPV would be Zero or less

$$Z = \frac{0 - \text{NPV}}{\sigma}$$

The Z Value is converted with the 'Z Table' values and the probability of the NPV being zero or less would be =  $0.5 - (Z \text{ Value})$ .

v) Probability that NPV being greater than Zero would be  $1 - (\text{Probability less than Zero})$

vi) Probability that NPV within the range X and Y

$$Z_1 = \frac{X - NPV}{\sigma} \quad Z_2 = \frac{Y - NPV}{\sigma}$$

vii) If in the Risk adjusted Discount approach both cost of control and Risk adjusted discount rate is given

- For the CF of the years apply Risk adjusted discount rate to find Discounted CF.
- For the Scrap value of the machine after the end of the life the CF on sale is discounted at cost of capital % to find Discounted CF.

viii) If probability (or) Certainty equivalence is given then find the Adjusted CF (CF \* Probability) and then use the Risk less Rate of return to find Discounted CF.

ix) Risk is Standard deviation

Summary:-

- i) Risk Adjusted Discount Rate Approach  
= NPV for CFAT at Risk Adjusted Discount Rate
- ii) Certainty Equivalent Approach  
= NPV for (CE coefficient \* CFAT) at Risk less interest rate
- iii) Probability Discount Approach  
= NPV for (CF) at Risk less Interest Rate

## Derivatives

Call Option: - Gives buyer “Right but not the obligation” to buy the share.

Put Option: - Gives buyer “Right but not the obligation” to sell the share.

Value of the Call Option:-

## i) Black Scholes Model:-

$$\begin{aligned} \text{Value of the call option} &= V_o \\ &= [S * N(d_1)] - [(x) * (e^{-t*r_f}) * (N(d_2))] \end{aligned}$$

$$\text{Where } d_1 = \frac{\ln(s/x) + (r_f + \{\sigma^2 / 2\}) * t}{\sigma \sqrt{t}}$$

$\ln$  = Natural log

$$d_2 = d_1 - \sigma \sqrt{t}$$

s = Present spot rate

x = Future strike (excise) price

$r_f$  = Risk free rate

Seven step to solve the problem:-

i) Find log (s/x)

ii) Find  $d_1$

iii) Find  $d_2$

iv) Find N ( $d_1$ )

v) Find N ( $d_2$ )

iv) Find N ( $d_1$ ) | Normal Table Value

v) Find N ( $d_2$ ) | + 0.5

vi) Find 'e' value

vii) Apply Black Schools Model.

Sub step to step 1:-

$$\text{a) Log (s/x) = } \frac{\text{Log s} - \text{Log x}}{0.4343}$$

b) If x and s are 2 digit figure the value shall be (1 + Log table value).

c) If x and s are 3 digit then the value shall be (2 + Log table value).

Sub step to step 6:-

a) It is to find the power value of 'e'.

$$\text{b) } e^{-t*r_f} = \frac{1}{1 + r/365 * \text{No. of days (t)}} \quad (\text{or}) \quad \frac{1}{1 + r/365 * \text{No. of Months (t)}}$$

Value of Put option: -

$$= [(x) * (e^{-t*r_f}) * (N(-d_2))] - [S * N(-d_1)]$$

Excise price:-

It is the price at which the person writes the prices on a share to buy after a period.



Expected Value of the share:-

It is the total of estimate market price of the share multiplied with the respective probability.

Expiration value: - Excise price – Expected Value

Expected (or) Theoretical value of the call option price at expiration (Pay off of Call option) :-

$$= \sum (\text{Estimated market price} - \text{Excise Price}) * \text{Probability} \quad (\text{or})$$

$$= [\text{Max}(s - x), 0] * \text{Probability}$$

↓  
Pay off of call option

Expected (or) Theoretical value of the put option price at expiration (Pay of put option):-

$$= \sum (\text{Excise Price} - \text{Estimated market price}) * \text{Probability} \quad (\text{or})$$

$$= [\text{Max}(x - s), 0] * \text{Probability}$$

↓  
Pay off of Put option

Where (Estimated market price – Excise Price) is called pay off. If it is negative it is taken as zero.

s = Estimated Market Price.

Put call parity = Put call parity equation is

$$(\text{Value of call option} + \text{Present value of excise price}) = (\text{value of put option} + \text{Spot rate})$$

Note:-

- i) Changes to be made in computation of Black Scholes model for dividend stocks:-  
 Substitute in all the places of “s” with “s – PV of dividend”
- ii) In the above all PV is found at Risk free rate.

**Beta**

Beta means, it measures the volatility of securities to the changes in the market.

$$\beta \text{ (level of risk)} = \frac{\sigma_s}{\sigma_m} * \text{Cor}(s,m) \quad \text{where } \sigma_s = \text{SD of return on securities}$$

$$\sigma_m = \text{SD of return on market portfolio}$$

$$\text{(or) Covariance}(s,m) / \sigma_m^2$$

$\beta$  should always be applied on risk premium and not to the entire return.

$$r_s = r_f + (r_m - r_f) * \beta$$

Where  $r_f$  = Risk free rate

$r_s$  = Expected return on securities (or) [Capital Appreciation + Dividend of the company]

$r_m$  = Expected return on market portfolio (or)

[Market index {Market rate} appreciation + Market dividend yield %]

Portfolio Theory (PT):-

$$r_p \text{ (expected return under CML)} = r_f + (r_m - r_f) * (\sigma_p / \sigma_m)$$

The above formula is based on total risk.

Where  $\sigma_p$  = SD of efficient portfolio.

When expected return under efficient portfolio is asked then

$r_p$  (expected return under efficient portfolio) = Capital market line(CML) –

Express equilibrium price relationship between expected return and DS

Capital Asset Pricing Model (CAPM):-

$$r_s \text{ (expected return portfolio in CAPM)} = r_f + (r_m - r_f) * [(\sigma_s / \sigma_m) * \text{cor}(s,m)]$$

$$\text{(or) } r_f + [(r_m - r_f)] * \beta$$

Where  $r_m = r_f + \text{Market premium}$

$$\text{Beta of the portfolio} = (\beta_a * P_a) + (\beta_b * P_b)$$

Where  $P_a, P_b$  = Proportion of investment in Company A and Company B.

Note:-

i)  $(r_m - r_f)$  = Market risk premium (or) Compensation per unit of risk.

ii)  $\text{Cor}(s,m)$  is +1 under CML

iii)  $r_f + (r_m - r_f) * [(\sigma_s / \sigma_m) * \text{cor}(s,m)]$  = This portion in CAPM formula is risk premium

iv)  $(r_m - r_f) / \sigma_m =$  Market risk return trade off (slope).

Notes:-

To find the investment to be made in risk free investments to get a certain  $\beta$  is

$$\begin{aligned} \beta \text{ of expected portfolio} &= (W_1 * \beta_1) + (W_2 * \beta_2) \\ \text{(or)} &= (W_1 * \beta_1) + (1 - W_1) \beta_2 \end{aligned}$$

Where  $W_1$  is weight given to existing securities.  
 $W_2$  is weight given to risk free securities.

In this case  $\beta_1$  is  $\beta$  of existing securities and  
 $\beta_2$  is  $\beta$  of  $r_f$  securities (ie.0)

This can also be use to find investment in other then  $r_f$  securities. In that case that  $\beta$  is substituted in  $\beta_2$ .

The weight ( $W_1, W_2$ ) is multiplied with market value of existing portfolio to find the proportion of investment.

## Holding Companies

### Index of Main Points:-

1. If there is a Debit balance in Minority Interest first it is adjusted against uncalled capital and balance is adjusted against reserve.
2. In case of Cumulative Preference shares of subsidiary dividend declared must be deducted from P & L a/c of subsidiary.
3. If no dividend is declared in above case then don't deduct.
4. If dividend is declared for Cumulative Preference shares then deduct from P & L a/c of subsidiary and balance is splitted. If not declared then it must be shown outside the Balance sheet.
5. But in the case1
6. CFS deduct in the above case whether declared or not.
7. Preference shares of subsidiary held by the holding company is to be cancelled against investment of Holding company while preparing CFS.
8. If Holding company sells goods below cost then unrealized loss is calculated by taking cost or Net Realizable Value whichever is lower for valuation.
9. If there is difference in accounting policy between Holding and subsidiary then both should be brought under uniform policy before consolidation.
10. If uniform policy cannot be brought then it should be disclosed.
11. The effect of change in Accounting Policy before acquisition must be taken as pre acquisition reserve and after post acquisition reserve.
12. If Holding Company holds Debenture in subsidiary then while preparing CFS it should be cancelled as Inter Company loan.
13. In above case if excess is paid for Debenture holders then the excess is adjusted against consolidated reserve.
14. Pre acquisition reserve and profit is treated as capital profit
15. Post acquisition reserve and profit is treated as revenue reserve and revenue profit respectively.
16. Miscellaneous expenses of subsidiary must be deducted against reserve as Capital or Revenue Reserve.
17. In case of Inter Company transactions if it is down stream then unrealized profit of Holding company must be adjusted against Consolidated P & L a/c.
18. In case of Inter Company transaction if it is upstream it is splitted into two as belonging to Holding company and Minority Interest and the former is deducted against Consolidated P & L a/c and Minority Interest is deducted from computation of Total Minority Interest.
19. Post acquisition dividend received is to be retained in P & L a/c.
20. Pre acquisition dividend received is to be transferred from Holding company P & L a/c to Cost of Investment.

21. Post acquisition dividend receivable (Proposed) by Holding company out of subsidiary current year profit is to now credited to Holding company Consolidated P & L a/c.
22. In case of analysis of profit Proposed Dividend must be deducted from current year profit only.
23. If in the above case if there is inadequate profit for dividend, the appropriation should be done 1<sup>st</sup> out of current year profits and thereafter out of b/f profit.
24. In case Inter Company sale or purchase is carried between two subsidiaries then for consolidated stock it is considered as it is 1<sup>st</sup> transferred from one subsidiary to Holding – upstream rule apply and then from Holding to 2<sup>nd</sup> subsidiary – Down stream rule apply.
25. In Inter Company transaction if there is sale of Fixed Asset between Holding and Subsidiary unrealized profit should be removed only to the extent of unamortized portion.
26. In the absence of information regarding rate of depreciation, depreciation must be ignored.
27. In case of acquisition and sale of shares, profit on such sale must be included in P & L a/c while calculating reserves for CBS.
28. In the event of current year dividend is greater than the trading profits AND if there is another source of income i.e. Subsidiary dividend then the dividend declared must be deducted only in Apportionment of profits.
29. Inter corporate loans in general refer to borrowings from corporate bodies.
30. In case of reverse working
  - for stock consolidation = Company A + Company B – Stock reserve
  - for Debtors and creditors = Company A + Company B – Inter company consolidation transactions
31. In case of Associate accounting Inter Company transaction should not be cancelled only Holding company interest of unrealized profit is only taken.
32. Losses in associate are taken only up to the liability in share capital.
33. Minority Interest calculation is not applicable in case of associate accounting.
34. In the case where subsidiary company is foreign company then convert the accounts into Indian Currency and remaining are same. For conversion rules applicable are:-
  - Share capital – Rate on the date of acquisition of share.
  - Reserves – Pre – Rate on the date of acquisition
  - Post – Average rate
  - Current Assets, Current liabilities – Closing rate
  - Fixed assets, Investments – Rate on the date of acquisition
35. Exchange rate difference which occurs on the above conversion is to be setoff against post acquisition Profit / Reserves and the balance is only to be apportioned for consolidation procedure.

36. In case of two or more acquisition by Holding Co. (or) acquisition and sale, In all the cases date for apportionment etc is the date of 1<sup>st</sup> acquisition and share holding pattern is the final share holding pattern.
37. In case of Associate accounting, to find the carrying amount of Investment of the associate in the consolidated balancesheet the calculation is similar to minority interest. Only difference is to add the goodwill found in COC.

,ie,	Share Capital	***	
	(+) Capital Profit	***	
	(+) Revenue Profit	***	
	(+) Goodwill	<u>***</u>	***

## Amalgamation

### Index of Main Points:-

1. Points to be satisfied to treat the amalgamation in the nature of merger
  - All assets and liabilities of transferor is to be taken over at their book values by resulting company
  - All or at least 90% of the Share Holding of Amalgamating Company must be the Share Holders of Amalgamated Company.
  - Equity shares of selling company must be given only equity shares of purchasing company.
  - Liabilities of Transferor must not be discharged; it must be taken over by the resulting company. But exemption is the fraction shares can be given in cash.
  - Same risk and return and nature of company must be same.
2. Order of Adjustment of consideration is first General Reserve and then P & L a/c. If the problem has statutory reserve it should not be adjusted. It is carried over as such.
3. As per SEBI guidelines, underwriting commission is 2.5% on equity shares and on 1<sup>st</sup> 5000 Preference Shares it is 1.5% and the balance Preference Shares it is 1%.
4. Capital employed is considered as Net Revaluation amount of Tangible Asset.
5. In case purchasing company holding shares in selling company, Net asset method is applied as usual and outside shareholders portion is calculated separately as balancing figure.
6. If in the above case, settlement of equity share holding of selling company is given then that exchange pertains to outside share holder's settlement and it should not be splitted.
7. In the books of selling company the shares held by the purchasing company must be cancelled by transferring it to realization a/c
 

Equity share capital a/c	Dr
	To Realization
8. If Preference share holders of selling company is discharged by preference share holders of purchasing company at premium then the premium portion must be transferred to realization a/c in the books of selling company.
9. In case of Merger while drafting Journal Entry in the books of purchasing company for Incorporation of Asset & Liability in the workings, the

- consideration is aggregate consideration including shares already purchased by purchasing company and current purchase payable.
10. In case of merger in the books of purchasing company while calculation excess / shortage to be adjusted against the reserve of selling company. The purchase consideration is aggregate consideration including amount already paid (shares of selling company held by purchasing company) + amount now paid (amount paid to outsiders).
  11. Business purchase in case of shares of selling company held by purchasing company is the amount given to outsiders only.
  12. If in the asset side of selling company Debtors is given as Gross (–) Reserves / Provision for Doubtful Debts then in the books of selling company while transferring all assets and liabilities to realization account Debtors is transferred at gross amount and provision is transferred along with liability.  
But in the above case in the books of purchasing company while incorporating assets and liabilities of selling company debtors is taken net of provisions.
  13. On entry for takeover of assets and liabilities of selling company in purchasing company books – Assets debited must be excluding goodwill in purchase method and difference in debit or credit is treated as Goodwill / Reserves.
  14. Investment allowance Reserve is not a current liability.
  15. When purchasing company holding shares in selling company then the shares held by purchasing company must be cancelled in the selling company books.
  16. While canceling the shares held by the purchasing company it must be cancelled at fair value.
  17. To bring the reserve like Investment allowance reserve in purchasing company books the entry will be
 

Amalgamation adjustment a/c	Dr
	To Investment allowance reserve

In the amalgamated B/S investment allowance reserve will appear in the liability side and amalgamation adjustment account will appear in the asset side for same amount.
  18. In case of Inter Company holding if dividend is declared by any one company then dividend receivable by other company is to be 1<sup>st</sup> incorporated as pre amalgamation event.
 

Dividend receivable account	Dr
	To P & L a/c

Entry in the 1<sup>st</sup> company which has declared dividend
 

P & L a/c	Dr
	To proposed dividend
  19. In case of Internal reconstruction cancellation of Arrears Dividend forgone by shareholder will not affect the B/S. So no entry. In this case Arrears of dividend is seized to be contingent liability. Preference shareholders will seize to have the voting right at par with equity shares which was available due to arrears of dividend.



20. In Demerger while making transfer entry of Asset and liability in purchasing company fixed asset net is to be taken but while making the transfer entry in selling company fixed asset gross is taken in credited and provision for depreciation is debited.
21. In case of Inter Company / Single side holding etc. to find the intrinsic value of each company, the investment held by one company in the shares of other company is also to be valued as intrinsic value only and not to be taken at book value. For inter company holding this intrinsic value of shares of each company can be found by framing a linear equation.
22. In case of calculation of purchase consideration (Cross holding)
- |   |            |
|---|------------|
| Total number of shares in selling company                       | ***        |
| (-) Share already held by Purchasing company                    | <u>***</u> |
| Number of shares held by outsiders                              | <u>***</u> |
| Value of above number of shares                                 | Rs. ***    |
| Number of purchasing company to be issued to selling company    | ***        |
| (-) Number of shares already held by selling company            | <u>***</u> |
| Net number of shares purchasing co. has to issue to selling co. | <u>***</u> |
23. In case of settlement of shareholders of selling company the amount will be = Shares now received from purchasing company + Purchasing company shares already held by selling company.
24. In amalgamated B/S if there is Debit in P & L a/c it should be netted of with General Reserve as per schedule VI.
25. In case of assets and liabilities is taken over at revalued amount it is in the nature of purchase and in the journal entry for incorporating account takeover only the revalued amount is to be taken.
26. In case of selling company holding shares in purchasing company then investment is to be valued at intrinsic value if specified.
27. In the above case of holding company gives shares at particular value to the subsidiary company for settlement then investment is to be valued at the value
28. When selling company holding shares in purchasing company then while transferring assets and liabilities to realization account in selling company books, Assets transferred must be excluding the Investment in purchasing company.