ENGINEERING ECONOMY

In engineering many decisions, which have to be taken, concern costs quite as much as performances. For better decisions interest, depreciation and profit should also be considered when deciding about purchasing a production facility.

All human activities related to wealth and meant to satisfy human wants directly or indirectly are called “economic activities” and these are the subject matters of “Economics”. Economics is a science as well as an art. It shows the relationship between cause and effect involved in various economic phenomena, which is the function of science. It also prescribes certain rules and guidelines for maximisation of material prosperity which is the function of art.

Engineering Economy is a discipline concerned with systematic evaluation of the costs and benefits of proposed technical and business projects and ventures. There is a saying – “The engineer does for one dollar what others do for two”.

Functions of Engineering Economy

1. Develop the alternatives.
2. Focus on the differences of the alternatives
3. Use a consistent viewpoint for all the alternatives
4. Use a common unit of measurement for comparison among alternatives
5. Consider all relevant criteria
6. Make uncertainty explicit
7. Review your decisions

Principles of Engineering Economy

1. Develop the alternatives - The decision (choice) is among alternatives. The feasible alternatives need to be identified and then defined for subsequent analysis.
2. Focus on the differences of the alternatives – Only the differences in the expected future outcomes among the alternatives are relevant to their comparison and should be considered in the decision.

Source - Internet
3. Use a consistent view point for all the alternatives – The prospective outcomes of the feasible alternatives, economic and other, should be developed from a consistent and defined view point.

4. Use a common unit of measurement for comparison among alternatives – Using a common unit of measurement to enumerate as many of the prospective outcomes as possible will make easier the analysis and comparison of the feasible alternatives.

5. Consider all relevant criteria – Considering all relevant criteria, selection of preferred alternatives is done.

6. Make uncertainty explicit – Uncertainty is inherent.

7. Review your decisions – Improved decision making results from an adoptive process.

Scope

- Comparison of alternative proposals, e. g.,
  1. The defective machine should be replaced or maintained.
  2. By taking loan a particular sick business should be continued or closed down.
  3. A product or part should be manufactured inside or should be subcontracted.
- When investment is required, the time value must be considered.
- When machinery and plant are required, the depreciation must be considered.
- When material is an important requirement, procurement policy and market analysis must be considered.
- Most of the proposals involve organized effort. In such cases labour costs must be considered.
- When the accepted engineering proposal becomes successful, a net income is generated. Thus consideration of accounting and income tax becomes necessary.
ACCOUNTING OF BUSINESS TRANSACTIONS

Definition of Accounting

Accounting may be defined as the process of collecting, recording, classifying, summarising, analysing and communicating financial information.

Accounting is the art of recording, classifying and summarising in significant manner and in terms of money transactions and events which are, in part, at least of financial character and interpreting the results thereof.

According to AAA (American Accounting Association):

Accounting is the process of identifying, measuring and communicating economic information to permit informed judgement and decision by user of the information.

Functions of Accounting

i. Recording of all financial transactions - Journal
   ii. Classifying - Ledger
   iii. Summarising - Trial Balance, Income Statement (Profit & Loss Account), Balance Sheet (Assets & Liabilities)
   iv. Analysis and Interpreting - Ratio Analysis
   v. Communicating - Ratios, Graphs, Diagrams etc.

Source - Internet
Some terms in accountancy

BOOK KEEPING

Book keeping is an art of keeping written records of all the dealings in money, goods or services in a business, so that they may not be forgotten. It is generally called “Bahi-Khata” in the business community in India.

Book keeping may be defined as an activity concerned with the recording of financial data relating to business operations in a significant and orderly manner. Book keeping is the record making, classifying and summarising phase of accounting.

As a matter of fact, accounting begins where book-keeping ends.

In a good book-keeping system (in case of trading) the records will show the following at once :-

1. Purchases, Sales and Returns during a given period.
2. The quantity and value of goods in hand at any time.
3. Total cash received and paid away and balance of cash in hand at the bank.
4. Details of all transactions with debtors and creditors.
5. Details of the profits or losses for the trading period.
6. A statement of all the assets and liabilities at the close of the period.

SINGLE AND DOUBLE ENTRY SYSTEM OF BOOK-KEEPING

**Single Entry System** – This is also called “Incomplete Record”.

- Only some essential records are kept.
- The system is not reliable as all the records are not kept.
- May be used for small business firms.

**Double Entry System** – This is also called “Mercantile Accounting System” invented by Italian merchant Incas Pacioli.

- All records are kept, so maximum information of business affaires may be obtained.
- The theory of double entry system of book-keeping is based on the fact that each business transaction affects two accounts – if one account receives a benefit in the form of cash, goods or services, there must be a corresponding equal loss of benefit by another account. The receiving account is said to be debited and the giving
account is said to be credited. Thus for each business transaction there must be an
equal debit entry for a credit entry or vice-versa.

There are three stages of double entry system of book-keeping:

1. Recording through Journal
2. Classifying through Ledger and
3. Summarising through Trial Balance, Balance Sheet & PL Account

JOURNAL

A journal may be defined as a book containing a chronological record of all business
transactions. This is known as the original record.

Columns in a Journal are Date, Particulars, Ledger Folio (L.F.), Debit and Credit.

LEDGER

A ledger may be defined as a book containing various accounts, like Cash A/C, Capital A/C,
Purchase A/C etc. Each account usually occupies one page in the ledger, but sometimes it
may occupy two or three pages also depending upon the length of the account. The pages
are called “Folios” and are numbered consecutively.

The account is the permanent record kept by sorting out all the transactions related to the
same person or thing. This process of sorting out or classifying the business transactions
from the journal and transferring them to their respective accounts in the ledger is called
“ledger posting”.

Columns in a Ledger are Date, Particulars, Debit Amount (Dr) and Date, Particulars, Credit
Amount (Cr). In “Debit Side” particulars are preceded by a word “To” and in “Credit Side” by
a word “By”.

TRIAL BALANCE

Trial Balance is prepared at the end of a closing period to check the accuracy of posting into
the ledger.

For preparing a Trial Balance the two sides of each account are added and the totals are
placed in the two columns of the Trial Balance.

Source - Internet
PROFIT & LOSS ACCOUNT

It is also prepared at the end of a closing period to know the net profit or loss.

BALANCE SHEET

It is the last and most important statement. BS is prepared at the end of a closing period to know the financial position of the business. It is not an account, but only a statement containing the assets and liabilities at the end of the closing period. Balance sheet are normally drawn up annually, quarterly, monthly or at other regular intervals.

ASSETS

Assets are the resources owned by a business. These are the things of value possessed by the owner of the business, e.g., building, plant and machinery, furniture, stock of goods.

There are three types of Assets:

1. **Fixed Assets** – These assets are of permanent character. They are also called Capital Assets. They are not bought to sell again, but are intended for use in the business.

2. **Current Assets** – They are also called Floating Assets. These are purchased or made with the intention of selling them.

3. **Fictitious Assets** – They are usually expenses or losses of large amount which can not be changed against the profit for the period in which they arise. They are shown as assets and are gradually depreciated. “Preliminary expenses” in the head under which comes - the cost of floating a company, paying for the prospectus, stamp duty, legal and banking fee etc. This “Preliminary expenses” appears as an asset in the balance sheet, until it is completely written off by depreciation.

EQUITY

Equities are the claims of various parties against the assets. Equities are of two types:

1) Owners’ Equity – It is also called “Capital”

2) Outsiders’ Equity – It is also called “Liabilities”

Source - Internet
Equities = Assets
Or, Liabilities + Capital = Assets

This is called “Accounting Equation”

CAPITAL

The amount of cash or goods which the proprietor of a business invests in it is called the proprietor’s capital.

LIABILITIES

They are debts due by a business to its proprietors and others, e.g., capital, creditors etc.

PURCHASE

Goods purchased for the business are called purchases.
Principles of Accounting

Accounting principles (also called Accounting Standards) may be defined as those rules of action or conduct which are adopted by the accountants universally while recording accounting transactions.

There are two categories of these principles:

- **Accounting Concepts** (also called Accounting Postulates) – These are basic assumptions or conditions on which accounting is based. Following are the important accounting concepts:
  1. Separate Entity Concept
  2. Going Concern Concept
  3. Money Measurement Concept
  4. Cost Concept
  5. Dual Aspect Concept
  6. Accounting Period Concept
  7. Periodic Matching of Cost & Revenue Concept
  8. Realisation Concept

- **Accounting Conventions** – These are the customs and traditions which guide the accountant while preparing the accounting statements. Following are the important accounting conventions:
  1. Convention of Conservatism
  2. Convention of Full Disclosure
  3. Convention of Consistency
  4. Convention of Materiality

**ACCOUNTING CONCEPTS (OR, ACCOUNTING POSTULATES)**

1. **Separate Entity Concept**

In accounting, business is considered to be a separate entity from the proprietor(s). This concept is very much helpful in keeping business affairs free from the effects of private affairs of the proprietor(s).

As per this if a proprietor invests Rs.10,000/- in a business then in the books of the business Rs.10,000/- will be shown as a liability to the business. If the proprietor withdraws Rs.2000/-
from business, he will be charged Rs.2000/- and the books of the business will show that the net amount payable to the proprietor is Rs.8000/- only.

2. **Going Concern Concept**

According to this concept it is assumed that the business will continue for a fairly long time to come. There is neither the intention nor the necessity to liquidate the business venture in foreseeable future. This concept avoids the valuation of assets by the accountant based on a forced sale value. Also, depreciation is calculated based on the asset expected life and not on the basis of present market value.

3. **Money Measurement Concept**

Accounting records only monetary transactions. Events or transactions which can not be expressed in terms of money do not find place in the books of account though they may be very useful for the business.

For example, if a business has got a team of very dedicated and trusted employees, it is definitely an asset to the business but since their monetary measurement is not possible, they are not shown in the books of accounts of the business.

4. **Cost Concept**

According to this concept

a) An asset is ordinarily entered in the accounting records at the price paid to acquire it and

b) This cost is the basis for all subsequent accounting for the asset

For example, if a business purchases a plot of land for Rs.50,000/- and at the time of recording in the book its market value is Rs.60,000/- then Rs.50,000/- will be recorded and not Rs.60,000/- . If after one year the market value of the plot is Rs.40,000/- or Rs.65,000/- then the book value will be shown at Rs.50,000/- only and not at Rs. 40,000/- or Rs.65,000/-.

5. **Dual Aspect Concept**

According to this concept every business transaction has a dual effect.
For example, if a person starts a business with a capital of Rs.10,000/- then there are two aspects of the transaction. First, the business has an asset of Rs.10,000/- and Second, the person (proprietor) has a capital of Rs.10,000/- which is to be payable by the business.

This is expressed in the form of following equation:

**Capital (Equities) = Cash (Assets)**

**Assets**: This denotes the resources owned by the business

**Equities**: This denotes the claims of various parties against the capital, the proprietor being one party. There are two types of equities:

a) Owners’ Equity (or Capital) – is the claim of owners against the assets of the business.

b) Others’ Equity (or Liabilities) – is the claim of outside parties against the assets of the business. They are Creditors, Debenture-holders etc.

Since all the assets of the business are claimed by either owners or outsiders, the total of assets will be total of liabilities and capitals.

**Equities = Assets**

Or **Liabilities + Capitals = Assets**

6. **Accounting Period Concept**

According to this concept, the life of the business is divided into appropriate segments. Though the life of a business is considered to be indefinite (according to Going Concern Concept), the measurement and analysis of the financial position of the business at the end of appropriate interval of time is necessary so that appropriate corrective actions may be taken at appropriate time if something wrong happens to the business. Such a segment of time interval is called ‘Accounting Period’ and is usually one year.

7. **Periodic Matching Of Cost & Revenue Concept**

This is based on Accounting Period Concept. Income made by a business during a period may be measured only when the revenue earned during that period is compared with the expenditure incurred for earning that revenue.

For example, suppose a salesman is paid commission in January, 2007 for his sale in December, 2006. Then his commission will be considered as a cost for December, 2006 for

Source - Internet
earning revenue by that sale. This matching of cost and revenue is very much important to take care of.

It is very much important to note that adjustments are made for all outstanding expenses, accrued incomes, prepaid expenses and unearned incomes etc. While preparing the final accounts at the end of accounting period.

8. Realisation Concept

According to this concept revenue is recognised only when a sale is made and a sale takes place only when the goods passes to the buyer and the buyer becomes legally liable to pay for it.

For example, X gets order from Y for some goods. On receipt of order X purchases raw materials, employs labour, manufacture the goods and supplies to Y. On receipt of goods Y makes payment. Here sale is executed at the point when the goods are delivered to Y and not when X gets the order.

Some exceptions are there, e.g., in case of hire purchase and contract work.

- In case of Hire Purchase – Ownership of the goods passes to the buyer only when the last instalment is paid. However, sale is presumed = the amount (instalments) received + the amount (instalments) due.
- In case of contract work – The contractor performs the work in part and gets payments in part as per contract when the work is certified year after year.

Source - Internet
1. **Convention of Conservatism**

In the initial stages of accounting certain anticipated profits which were recorded by the accountants, did not materialise. Due to this the accounting became doubtful and unreliable. To avoid this and to play safe the accountants follow this rule – while recording business transactions “anticipate no profits, but provide for all possible losses”.

Examples –

- Inventories are valued at cost or market price whichever is less.
- In contract accounts, profit is considered only when the contract is substantially completed.
- R & D expenses are charged as expenses for the period they incurred, however benefits due to R & D will be in future periods also.
- When goods are delivered to the buyer, revenue is recognised only when cash is received by the seller or his agents.

2. **Convention of Full Disclosure**

According to this convention, accounting reports should disclose fully and fairly the information they purport to represent. The accounting reports should be honestly prepared and they should sufficiently disclose information which is of material interest to proprietors, creditors and investors.

3. **Convention of Consistency**

According to this convention, accounting practices should not change from period to period. This is necessary for comparison of results of one accounting period to that of other accounting periods. This also avoids inflation or deflation of profit figures due to change in accounting practice / technique.

For example,

- If the stock is valued at “cost or market price whichever is less”, this convention should be followed year after year.
- If depreciated is charged on fixed assets according to “diminishing balance method”, this convention should be followed year after year.
Consistency does not mean that the accounting should be inflexible. In case of adopting some improved accounting techniques, a note is mentioned in the financial statements.

4. **Convention of Materiality**

According to this convention, the accountant should attach importance to material details and ignore insignificant details.

This is important to avoid overburdening the accounting with unnecessary minute details.

For example, if a debtor is given his statement of account, complete details up to paisa is important. But if the management is given the outstanding debtors’ statement, the figures may be rounded off to the nearest ten or hundred.
Accounts

An Account is a summarised record of financial transactions relating to a particular person, thing or service, e.g., Cash A/C, Salary A/C, Sales A/C, Purchase A/C etc.

CLASSIFICATION OF ACCOUNTS

**ACCOUNT**

- **Personal A/C**
  - Natural
  - Artificial
  - Representative

- **Impersonal A/C**
  - Real A/C
  - Nominal A/C
  - Valuation A/C

- **Real A/C**
  - Tangible
  - Intangible
  - Expense & Losses
  - Income & Gains

- **Nominal A/C**

**Personal A/C** – Records business transactions with persons or organisations. They may be debtors or creditors. There are three types of personal accounts:

1) **Natural Personal A/C** – Records transactions with partners, owners, money lenders, customers, suppliers. (Natural person means a human being)
2) **Artificial Personal A/C** – Records transactions with corporate bodies, financial or other institutions. (They are recognised as persons, e.g., Bank A/C)
3) **Representative Personal A/C** – Records provisions for a person or a group of persons related to the business, e.g., Outstanding Salary A/C, Outstanding Rent A/C, Salary Prepaid A/C, Insurance Unexpired.

**Impersonal A/C** – Records business transactions not related to persons or organisations. There are three types of impersonal accounts:

1) **Real Impersonal A/C** (or **Real A/C**) – Records transactions of commodities, assets and properties.
   a. **Tangible Real A/C** – Transaction of things which can be touched, felt, measured, e.g., land, building, furniture, plant, machinery, cash, goods.
b. **Intangible Real A/C** – transactions of things which can not be touched, felt, measured, e.g., patents, goodwill.

2) **Nominal A/C** – Records transactions of incomes, expenses, gains & losses, e.g., wages, salaries, discount allowed, purchase, sales, trade expenses, interest, commission, bad debt (loss).

3) **Valuation A/C** – Records provisions for depreciation and provisions for doubtful debts.

### RULES FOR DEBIT AND CREDIT

<table>
<thead>
<tr>
<th>A/C Type</th>
<th>A/C is Debited</th>
<th>A/C is Credited</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal A/C</td>
<td>Receives</td>
<td>Gives</td>
</tr>
<tr>
<td>Real A/C</td>
<td>What comes in</td>
<td>What goes out</td>
</tr>
<tr>
<td>Nominal A/C</td>
<td>Expenses &amp; Losses</td>
<td>Income &amp; Gains</td>
</tr>
<tr>
<td>Valuation A/C</td>
<td>When A/C to be decreased</td>
<td>When A/C to be increased</td>
</tr>
</tbody>
</table>

### ADVANTAGES & LIMITATIONS OF ACCOUNTING

**Advantages** – It provides financial information useful for making economical decisions.

**Limitations** – Accounting is historical in nature, so it does not reflect the current financial position or works of a business.

<table>
<thead>
<tr>
<th>A/C Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal A/C</td>
<td>• A/C of partners, owners, money lenders, customers, suppliers</td>
</tr>
<tr>
<td></td>
<td>– Capital A/C</td>
</tr>
<tr>
<td></td>
<td>• A/C of corporate bodies, financial or other institutions - Bank A/C, M/S N. Industries,</td>
</tr>
<tr>
<td>Real A/C</td>
<td>• land, building, furniture, plant, machinery, cash, goods - Cash A/C, Machinery A/C, Furniture A/C</td>
</tr>
<tr>
<td></td>
<td>• patents, goodwill</td>
</tr>
<tr>
<td>Valuation A/C</td>
<td>provisions for depreciation and provisions for doubtful debts</td>
</tr>
<tr>
<td>TRANSACTION</td>
<td>ACCOUNTS INVOLVED</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Rent Paid</td>
<td>Rent A/C, Cash A/C</td>
</tr>
<tr>
<td>Salaries Paid</td>
<td>Salaries A/C, Cash A/C</td>
</tr>
<tr>
<td>Interest Received</td>
<td>Cash A/C, Interest A/C</td>
</tr>
<tr>
<td>Dividends Received</td>
<td>Cash A/C, Dividends A/C</td>
</tr>
<tr>
<td>Furniture Purchased</td>
<td>Furniture A/C, Cash A/C</td>
</tr>
<tr>
<td>Machinery Sold</td>
<td>Cash A/C, Machinery A/C</td>
</tr>
<tr>
<td>Outstanding for Salaries</td>
<td>Salaries A/C, O/S Salaries A/C</td>
</tr>
<tr>
<td>Telephone Charges Paid</td>
<td>Telephone Ch. A/C, Cash A/C</td>
</tr>
<tr>
<td>Paid to Suresh</td>
<td>Suresh, Cash A/C</td>
</tr>
<tr>
<td>Recd. from Mohan (the proprietor)</td>
<td>Cash A/C, Capital A/C</td>
</tr>
<tr>
<td>Lighting Charges Paid</td>
<td>Lighting A/C, Cash A/C</td>
</tr>
<tr>
<td>Return of goods from Customer</td>
<td>Sales Return A/C, Customer’s A/C</td>
</tr>
<tr>
<td>Sales to Mahesh in cash</td>
<td>Cash A/C, Mahesh</td>
</tr>
<tr>
<td>Cash Discount Allowed to a Debtor</td>
<td>Cash Discount A/C, Customer’s (debtor) A/C</td>
</tr>
<tr>
<td>Bad Debt</td>
<td>Bad Debt A/C, Debtor’s A/C</td>
</tr>
</tbody>
</table>
SOME EXAMPLES

**Problem** – Journalise the following transactions of M/S Krishna Traders:

1. **6.2.2004** Commenced business Rs.40,000/-
2. **7.2.2004** Bought goods for cash Rs.600/-
3. **7.2.2004** Bought furniture Rs.200/-
4. **7.3.2004** Purchased goods from N.Industries on credit Rs.1,200/-
5. **7.5.2004** Sold goods to Jaiswal Rs.800/-
6. **7.5.2004** Sold goods to Paul Brothers on credit Rs.1,500/-
7. **7.8.2004** Returned goods to N.Industries Rs.200/-

### M/S KRISHNA TRADERS

**Journal**

<table>
<thead>
<tr>
<th>Date</th>
<th>Name of A/C (Debited or Credited)</th>
<th>L.F.</th>
<th>Dr.</th>
<th>Cr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>June 1</td>
<td>Cash A/C</td>
<td>40,000.00</td>
<td></td>
<td>40,000.00</td>
</tr>
<tr>
<td></td>
<td>To Capital A/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>July 2</td>
<td>Purchase A/C</td>
<td>600.00</td>
<td></td>
<td>600.00</td>
</tr>
<tr>
<td></td>
<td>To Cash A/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Furniture A/C</td>
<td>200.00</td>
<td></td>
<td>200.00</td>
</tr>
<tr>
<td></td>
<td>To Cash A/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Purchase A/C</td>
<td>1200.00</td>
<td></td>
<td>1200.00</td>
</tr>
<tr>
<td></td>
<td>To M/S N.Industries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Cash A/C</td>
<td>800.00</td>
<td></td>
<td>800.00</td>
</tr>
<tr>
<td></td>
<td>To Sales A/C(sold to Jaisawal)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>M/S Paul Brothers</td>
<td>1500.00</td>
<td></td>
<td>1500.00</td>
</tr>
<tr>
<td></td>
<td>To Sales A/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>M/S N. Industries</td>
<td>200.00</td>
<td></td>
<td>200.00</td>
</tr>
<tr>
<td></td>
<td>To Purchase Return A/C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td>44500.00</td>
<td>44500.00</td>
<td></td>
</tr>
</tbody>
</table>
Ledger Book

Cash A/C

<table>
<thead>
<tr>
<th>Date</th>
<th>Particulars</th>
<th>Dr. Amount</th>
<th>Date</th>
<th>Particulars</th>
<th>Cr. Amount</th>
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<tbody>
<tr>
<td>1951</td>
<td></td>
<td></td>
<td>1951</td>
<td></td>
<td></td>
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<tr>
<td>Dec 1</td>
<td>To Capital A/C</td>
<td>30,000.00</td>
<td>Dec 2</td>
<td>By Motor Truck A/C</td>
<td>10,600.00</td>
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<tr>
<td>5</td>
<td>&quot; Rattan Bros.</td>
<td>1,500.00</td>
<td>4</td>
<td>&quot; Office Stationery A/C</td>
<td>35.56</td>
</tr>
<tr>
<td>10</td>
<td>&quot; Ram Prashad &amp; Bros.</td>
<td>3,035.00</td>
<td>5</td>
<td>&quot; Carriage &amp; Octroi A/C</td>
<td>85.62</td>
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<tr>
<td>22</td>
<td>&quot; Mohanlal &amp; Sons</td>
<td>2,100.00</td>
<td>9</td>
<td>&quot; Hiralal Dalchand</td>
<td>2,000.00</td>
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<tr>
<td>23</td>
<td>&quot; Sales A/C (goods sold for cash)</td>
<td>1,510.67</td>
<td>12</td>
<td>&quot; Office Equipment A/C</td>
<td>415.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>12</td>
<td>&quot; H.N. &amp; Company</td>
<td>1,600.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>13</td>
<td>&quot; Sharma Trading</td>
<td>2,415.00</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>19</td>
<td>&quot; Sundry Trade Exp. A/C</td>
<td>45.62</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td>&quot; Furniture A/C</td>
<td>81.00</td>
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<td>23</td>
<td>&quot; Office Equipment A/C</td>
<td>185.00</td>
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<tr>
<td></td>
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<td>27</td>
<td>&quot; Purchase A/C (goods purchased for cash)</td>
<td>237.50</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>31</td>
<td>&quot; Motor Trc Expense A/C</td>
<td>280.50</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td>&quot; Rent A/C</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td>&quot; Office Salaries A/C</td>
<td>412.00</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>31</td>
<td>&quot; Balance c/d</td>
<td>19,652.87</td>
</tr>
<tr>
<td></td>
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<td></td>
<td></td>
<td>Total</td>
<td>38,145.67</td>
</tr>
<tr>
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<td></td>
<td>38,145.67</td>
<td></td>
<td>Total</td>
<td>38,145.67</td>
</tr>
<tr>
<td>1952</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jan 1</td>
<td>To Balance b/d</td>
<td>19,652.87</td>
<td></td>
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</tr>
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</table>

Source - Internet
COST AND COST ANALYSIS

Introduction

Engineering economy analysis and accountancy have a basic difference. Accounting involves recording of historical data (related to money) arising from the essential activities in a business and showing the financial position and performance (profit or loss) of the business by various statements. Engineering economy involves quantifying the expected future differences in the worth and cost of alternative engineering proposals. Accounting records are one of the most important sources of data for engineering economy studies. They provide detailed quantitative data useful in estimating the future outcome of activities similar to those completed.

TWO CLASSIFICATIONS OF ACCOUNTING

1) General Accounting – It provides two basic financial statements :
   a. Balance Sheet which shows financial position (assets, liabilities, net worth) of the business at a particular date
   b. Profit & Loss Account which shows performance (revenues, expenses) of the business for a particular period

   Thus the accounts of an enterprise fall into five general classifications - assets, liabilities, net worth, revenues, and expenses.

2) Cost Accounting – Cost accounting, in simple terms, is the determination of the cost of producing a product or rendering a service. It is a branch of general accounting and shows total costs involved in producing goods and services and selling them. It involves recording of costs of materials, labour and overhead on an item-by-item basis so that the cost of production and selling can be determined. Cost accounting is more important for engineering economy analysis. In fact, cost accounting has sometimes been called “accounting engineering”.

   Assets – Liabilities = Net Worth

Source - Internet
Cost Structure

TOTAL COST OF A PRODUCT

A product passes through various stages during production and finally sold to the ultimate customer. Total costs involved in producing goods (and services) and selling them is called total cost of the product and it includes: Material Costs, Labour Costs and Other Expenses, e.g., Rent of the factory buildings, Plant maintenance and expense, Water, lighting and electricity charges, factory salaries, Directors fees, Plant depreciation, Postage, telephone expenses, Printing and stationary charges, Rent of the office, Office salaries, Advertising, Rent of the Show Room, Commission of sales man, Sales dept car expenses, Cost of distributing goods etc.

So, following are the elements of cost:

1) Material Cost – Direct and Indirect
2) Labour Cost – Direct and Indirect
3) Other Expenses – Direct and Indirect

Indirect material cost, indirect labour cost and other such indirect expenses are called Overhead costs, or simply Overhead.

Here, there are two approaches to cost accounting:

1. The cost can not be known until production of goods or services is finished. That is costs are determined after they occur. This is sometimes called “post-mortem” cost accounting.
2. In the second approach, attempts are made to know the costs which will be incurred before actual production takes place. Accuracy of the cost determination depends upon experience, careful specification of materials & processes and detailed analysis and distribution of overhead expenses. These cost estimates are sometimes called “predicted costs”.

The predicted costs may deviate a lot from the actual costs due to unforeseen causes. When cost estimates include the provisions for these unforeseen causes and the control actions are taken to perform all operations in the manner which was specified, the actual costs match with the ideal. The costs so obtained are called “standard costs”. Thus, in this case cost accounting becomes not only a means of determining the costs but also an aid to control.

Source - Internet
OVERHEADS

Overhead is defined as the cost of indirect materials, indirect labour and such other indirect expenses including indirect services. These can not be charged conveniently to unit product specific cost.

Overhead = costs of material not charged directly to the product
+ costs of labour not charged directly to the product
+ Fixed costs (e.g., taxes; insurance; interest; rental; depreciation & maintenance of buildings, furniture & equipment; salaries of factory supervisors etc.)

Overhead is divided into following categories:

1) Factory overhead – Factory Overheads are also called factory expenses, shop expenses, burden, indirect costs and on-cost.
   - Taxes
   - Insurances
   - Interest
   - Rental
   - Depreciation & maintenance of buildings, furniture & equipment
   - Salaries of factory supervisors

2) Administrative overhead (usually it is expressed as percentage of Factory overhead)
   - Salaries of executives, technical personnel & clerks
   - Office space
   - Depreciation of office equipment
   - Travelling expenses
   - Charges for legal, technical & auditing services

3) Selling overhead – This is expenditure incurred on disposing off the products, e.g.,
   - Salaries of sales personnel
   - Commission
   - Office space
   - Depreciation of office equipment
   - Market survey expenses
   - Entertainment of customers
   - Displays & demonstrations
   - Advertisements

Source - Internet
4) Distribution overhead – This is cost of distributing goods to the sub-distributors, retailers or customers, e.g.,
   
   - Salaries
   - Transportation & goods carrying charges

SELLING PRICE OF A PRODUCT

Selling Price = Total Costs + Profit

Relationship between elements of cost and determination of selling price:

Methods of Allocating Overhead Costs

OVERHEADS

Overhead is defined as the cost of indirect materials, indirect labour and such other indirect expenses including indirect services. These can not be charged conveniently to unit specific cost. Overhead is divided into following categories: Factory overhead, Production or manufacturing overhead, R & D overhead, Administrative overhead, Selling overhead and Distribution overhead.

Allocation or Distribution of overhead costs in manufacturing concerns

   For single product (item)                 – easy to distribute
   For multiple products (items)            – complicated to distribute

Source - Internet
Allocation of overhead costs

There are different methods by which the overhead cost may be allocated to different jobs. The choice of method depends on the type of organisation – whether the organisation is labour intensive or material intensive or both.

Following are the important methods of distribution of overhead costs:

1) On-cost (factory overhead) proportion method
   a. Proportion to direct labour cost method
   b. Proportion to direct material cost method
   c. Proportion to prime cost method

2) Direct man hour (or labour hour) rate method

3) Machine hour rate method

4) Unit output rate method

For example, for distribution in proportion to prime cost,

\[
\text{Rate of overhead} = \frac{\text{Total overhead costs}}{\text{Total prime costs}} \times 100\% \quad \text{(which represents total overhead cost as percentage of prime cost)}
\]

This distribution is suitable when both material & labour cost are prominent factors in determining total cost.
<table>
<thead>
<tr>
<th>METHOD</th>
<th>FACTOR</th>
<th>ADVANTAGES</th>
<th>DISADVANTAGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Labour Cost method</td>
<td>Rate of overhead = Total overhead costs</td>
<td>• Easy</td>
<td>• No difference between manual labour and machine labour</td>
</tr>
<tr>
<td></td>
<td>Total direct labour cost</td>
<td>• Suitable where the labour cost is more in total cost</td>
<td>• Still wages of the workers may not be the same</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Suitable for products with manual operation</td>
<td></td>
</tr>
<tr>
<td>Direct Material Cost method</td>
<td>Rate of overhead = Total overhead costs</td>
<td>• Suitable when the method and matl. Are common to all products</td>
<td>• Not suitable where different types of materials go into product.</td>
</tr>
<tr>
<td></td>
<td>Total direct matl. cost</td>
<td>• Expenses on direct material is more in total cost</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Applicable for process industries such as cement, sugar, paint etc.</td>
<td></td>
</tr>
<tr>
<td>Prime Cost method</td>
<td>Rate of overhead = Total overhead costs</td>
<td>• Suitable where both material and labour are prominent factors in determining total cost</td>
<td>• No difference between manual labour and machine labour</td>
</tr>
<tr>
<td></td>
<td>Total prime cost</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man hour rate method</td>
<td>Rate of overhead = Total overhead costs</td>
<td>• More accurate than Direct Labour Cost method</td>
<td>• It does not consider variation in type &amp; size of equipment</td>
</tr>
<tr>
<td></td>
<td>Total productive hours worked</td>
<td>• Most suitable when manual operation is employed</td>
<td>• Additional record should be maintained</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Not suitable if manual &amp; machine operations are involved for a product.</td>
</tr>
<tr>
<td>Machine hour rate method</td>
<td>Machine Hour Rate = Total overhead costs</td>
<td>• Suitable for single overhead for entire plant and involve various operations with identical machine</td>
<td>• May not be suitable where more manual &amp; less machine operations are involved</td>
</tr>
<tr>
<td></td>
<td>Total machine hours for the period</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit output rate method</td>
<td>Overhead cost per unit production = Total</td>
<td>• Single</td>
<td>• May not be suitable for industry which produces many products</td>
</tr>
<tr>
<td></td>
<td>overhead costs no. of units produced</td>
<td>• Suitable where one type of product is produced</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Examples : per Kg, perfect touches</td>
<td></td>
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</table>

Source - Internet
BREAK EVEN ANALYSIS

Introduction

Break even analysis is the graphical analysis used to study the profit in response to the change in volume lots and price. This graphical analysis is very much useful to forecast the profit depending upon the available data. So, break even analysis is an important tool for decision making. It is also used for comparing costs of two or more alternatives to find out the most economical solution.

Break Even Analysis is very much helpful to provide some insight as to how profits change as sales increase or decrease. Frankly, predicting a precise amount of sales or profits is nearly impossible due to a company's many products (with varying degrees of profitability), the company's many customers (with varying demands for service), and the interaction between price, promotion and the number of units sold. These and other factors will complicate the break-even analysis.

Break-even analysis is also known by various names: break-even point, break-even formula, break-even point formula, break-even model, cost-volume-profit (CVP) analysis, or expense-volume-profit (EVP) analysis.

At the heart of break-even point or break-even analysis is the relationship between expenses and revenues. It is critical to know how expenses will change as sales increase or decrease. Some expenses will increase as sales increase, whereas some expenses will not change as sales increase or decrease. In break even analysis all cost are classified into two categories — fixed costs and variable costs.

**Variable Costs or Expenses** — Variable expenses such as direct material cost increase when sales increase. They also decrease when sales decrease. Variable costs include raw material costs, direct labour, sales commissions, freight costs, packaging, and energy costs (fuel, electricity, natural gas) associated with producing and selling the product.

**Fixed Costs or Expenses** — Fixed expenses do not increase when sales increase. Fixed expenses do not decrease when sales decrease. In other words, fixed expenses such as rent will not change when sales increase or decrease. These costs don't vary with the level of output of the business and would be incurred if production were to cease.

*Source - Internet*
They include rent, insurance, depreciation, salaries, property taxes, and other costs that are not directly associated with making or selling the product.

**Mixed Expenses** – Some expenses are part variable and part fixed. These are often referred to as mixed or semi-variable expenses. An example would be a salesperson's compensation that is composed of a salary portion (fixed expense) and a commission portion (variable expense). Mixed expenses could be split into two parts. The variable portion can be listed with other variable expenses and the fixed portion can be included with the other fixed expenses.

Break Even Point (BEP) is the point in the break even chart which shows the minimum number of units required to be produced to start making profit. At BEP the company makes neither profit nor loss.

**Drawing break even chart and calculation of BEP**

![Break Even Chart]

Since, \( \text{Selling Price} = \text{Total Cost} + \text{Profit} \)

Therefore, \( \text{Sales Revenue} = \text{Total Cost} + \text{Profit} \)

\[ = (\text{Fixed Cost} + \text{Variable Cost}) + \text{Profit} \]

At Break Even Point there is no profit, i.e., \( \text{profit} = 0 \)

*Source - Internet*
Therefore, \( \text{Sales Revenue} = \text{Total Cost} \)

Or, \( \text{Sales Revenue} = \text{Fixed Cost} + \text{Variable Cost} \)

Suppose, \( S = \text{Selling Price per unit} \)

\( F = \text{Fixed Cost} \)

\( V = \text{Variable Cost per unit} \)

\( Q = \text{Volume of production which was sold} \)

Then \( S \times Q = F + V \times Q + \text{Profit} \)

Or, \( (S - V) \times Q - F = \text{Profit} \)

If BEP is \( x \) units, then

\( (S - V) \times x - F = 0 \), i.e., \( x = \frac{F}{(S - V)} \) units

In terms of Sales Revenue

\[ \text{BEP} = \frac{F \times S}{(S - V)} \text{ Rupees} \]

**Angle of Incidence** – This is the angle made at BEP by sales revenue line with variable cost line.

**Margin of safety** – Margin of safety is the difference between sales revenue at full capacity and sales revenue at BEP.

**Contribution margin** - the amount in terms of money by which annual sales revenue exceeds annual variable costs. This margin contributes to the payment of annual fixed costs and, if larger than fixed costs, to profit.

**Contribution margin ratio** - is the contribution margin divided by sales (revenues)

The ratio can be calculated using company totals or per unit amounts

One can determine the break-even point in sales revenue (instead of units) by dividing the company's total fixed expenses by the contribution margin ratio.

\[ \text{Breakeven sales (Rs.)} = \frac{\text{Total annual fixed costs}}{\text{Contribution margin / Total sales}} \]
BEP = F x S / (S – V) Rupees = F / (S – V) / S Rupees

Example 1 (T/Sheet Q.3.)

The fixed cost for the year 1995-96 is Rs.80,000. The estimated sales for the period are valued at Rs. 2,00,000. The variable cost per unit for single product made is Rs. 4.00. If each unit sells at Rs. 20 and the number of units involved coincides with the expected volume of output, construct the Break-even chart and determine the following (i) Break even point (ii) How many units the company should produce in order to seek profit (iii) The profit earned at a turnout of Rs. 1,60,000 (iv) the margin of safety (v) the angle of incidence.

(Ans. At 5,000 units or Rs. 1,00,000, 5,000 units, Rs. 48,000, Rs. 1,00,000 50%,33.70°).

Let

S = Selling Price per unit = Rs. 20.00
F = Fixed Cost = Rs. 80,000.00
V = Variable Cost per unit = Rs. 4.00
x = Volume of production at BEP which was sold

Then

Sx = F + Vx

Or,
20x = 80000 + 4x

Or,
x = 5000 units

(i) and (ii) BEP = 5000 units

(iii) Sales Revenue = (Fixed Cost + Variable Cost) + Profit

Or,
160000 = 80000 + 4q + Profit

Or,
Profit = 160000 – 80000 – 4q

= 80000 – 4 (160000 / 20)

= 80000 – 32000

= 48000 Rupees

(iv) Margin of safety = sales revenue at full capacity – sales revenue at BEP

= 200000 – 5000 x 20 = 100000 Rupees

Source - Internet
Margin of safety (in %) = \frac{\text{sales revenue at full capacity} - \text{sales revenue at BEP}}{\text{sales revenue at full capacity}} \times 100

= 50\% \text{ of full capacity}

(v) Angle of incidence

\[ \tan \alpha = \frac{\text{Sales revenue at BEP} - \text{Fixed Cost}}{\text{Sales revenue at BEP}} \]

\[ \tan \alpha = \frac{(5000 \times 20 - 80000)}{5000 \times 20} = 0.2 \]

That is \( \alpha = 11.3^\circ \)

Therefore, Angle of incidence, \( \theta = 45^\circ - 11.3^\circ = 33.70^\circ \)

ASSUMPTIONS IN BREAK EVEN ANALYSIS

- All costs related to production, sales and distributions of product (or service) are divided into two costs – (i) fixed cost and (ii) variable cost.
- Sales revenue varies in direct proportion to the physical volume of production at constant rate. That is variable cost varies in fixed proportion.
- The price of input factors are assumed to be constant.
- The efficiency of machines or men remains constant.

ADVANTAGES OF BREAK EVEN ANALYSIS

- Very useful for forecasting results, e.g., evaluation to determine necessary levels of service or production to avoid loss.
- An important tool for decision making.
- For comparing different variables to determine best case scenario.
- For comparing costs of two or more alternatives to find out the most economical solution.

LIMITATIONS

- Sales price is dependant on demand & supply.
- The fixed cost may not remain fixed.
- The variable cost may not vary in fixed proportion.

Source - Internet