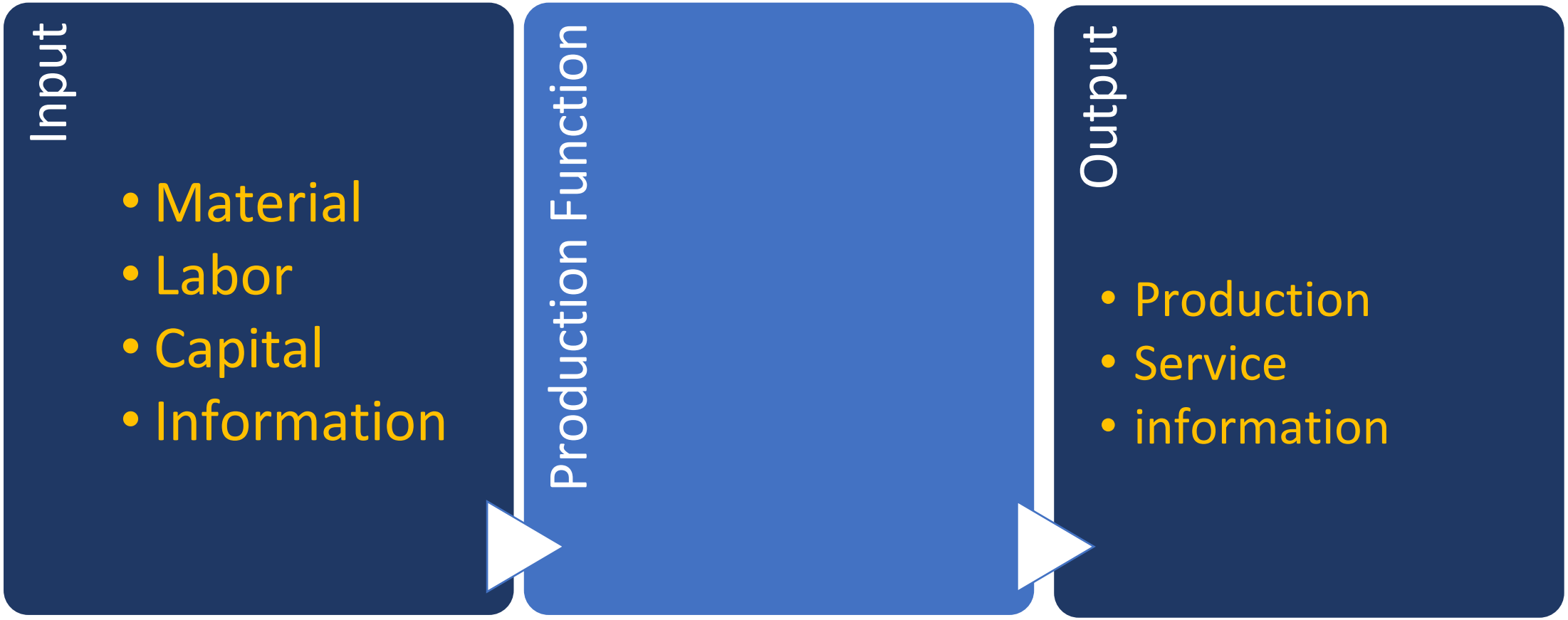
PRODUCTIVITY, PRODUCTTON SYSTEMS AND INDUSTRIAL OWNERSHIP

PRODUCTIVITY



* 11 Formula for Math

PRODUCTIVITY

- Productivity is defined as the ratio of output to input of a production system.

Productivity= Output/Input

PRODUCTIVITY

- Hence, to increase productivity we want to make this output to inputs as large as possible which can be practical. This can be achieved by :

  - Either productivity increase with the same inputs.
  - Or using fewer inputs for the same outputs.

Productivity and Production

- Productivity and Production
  - Production refers to the absolute measure of output whereas, productivity refers to the relative measure of output to input.
- Productivity and Profitability
  - Profitability is the ratio of difference of revenue and cost to investment.

$$\text{Profitability} = (\text{Revenue} - \text{Cost})/\text{investment}.$$

MEASUREMENT OF PRODUCTIVITY

Partial Productivity

- Ratio of output to one class of input among many factors of production

$$\text{Labour Productivity} = \frac{\text{Output}}{\text{Labour Input}}$$

$$\text{Capital productivity} = \frac{\text{Output}}{\text{Capital employed}}$$

$$\text{Material productivity} = \frac{\text{Output}}{\text{Materials input}}$$

MEASUREMENT OF PRODUCTIVITY

Total Factor Productivity

- Ratio of net output to the sum of associated labor and capital inputs.

$$\text{Total Factor Productivity} = \frac{\text{Net Output}}{\text{Labour inputs} + \text{Capital } \textit{inputs}}$$

- Net output= output- all input expenses except labor

MEASUREMENT OF PRODUCTIVITY

Total Productivity

- Total productivity is the ratio of total output to the sum of all input factors. Thus, it represents the joint impact of all the input factors in producing the output.

$$\text{Total Productivity} = \frac{\text{Total Tangible (measurable) Output}}{\text{Total Tangible Input}}$$

Total tangible output = Value of finished goods + value of partially finished units + dividends from securities + interest + other income.

Total tangible input = Value of human, material, capital, energy and other inputs used.

MEASUREMENT OF PRODUCTIVITY

- PRODUCTIVITY INDEX
  - Productivity index is used to compare the productivity during the current year with the productivity during the base year. Base year is any year which the company uses for comparative study.

$$\text{Productivity Index} = \frac{\text{Productivity during the current year}}{\text{Productivity during the base period}}$$

MEASUREMENT OF PRODUCTIVITY

Example 1 *Find the partial productivity and total productivity for a company for which the following data is available :*

Output = Rs. 15000, Labour input = Rs. 4500, Material input Rs. 3000, Capital input = 4500, Energy input = Rs. 1500, Other input expenses = Rs. 750. Assume the above values are in constant rupees with respect to a base period.

Solution

$$\text{Labour productivity} = \frac{\text{Output}}{\text{Labour input}} = \frac{15000}{4500} = 3.3$$

$$\text{Material productivity} = \frac{\text{Output}}{\text{Material input}} = \frac{15000}{3000} = 5.0$$

$$\text{Capital productivity} = \frac{\text{Output}}{\text{Capital input}} = \frac{15000}{4500} = 3.3$$

$$\text{Energy productivity} = \frac{\text{Output}}{\text{Energy input}} = \frac{15000}{1500} = 10.0$$

$$\text{Other expenses productivity} = \frac{\text{Output}}{\text{Other expenses input}} = \frac{15000}{750} = 20.0$$

$$\text{Total factor productivity} = \frac{\text{Net output}}{(\text{Labor} + \text{capital}) \text{ input}}$$

$$\text{Net output} = \text{Output} - (\text{Material input} + \text{Capital input} + \text{Energy input} + \text{Other expenses input})$$

MEASUREMENT OF PRODUCTIVITY

$$= 15000 - (3000 + 4500 + 1500 + 750)$$

$$= 15000 - 9750 = \text{Rs. } 5250$$

$$\text{Labour + Capital input} = (4500 + 4500) = \text{Rs. } 9000$$

$$\text{Therefore, Total factor productivity} = \frac{5250}{9000} = 0.583$$

$$\text{Total productivity} = \frac{15000}{4500 + 3000 + 4500 + 1500 + 750} = \frac{15000}{14250} = 1.05$$

Example 2 *Products X and Y are being manufactured by a company using materials A and B. Both materials are equally suitable. Product X is expected to sell at Rs. 75 per unit and product B at Rs. 35 per unit. The operating data is given below :*

	Material A	Material B
Output X	200 units	400 units
Output Y	300 units	200 units
Quantity of raw material usage	1000 kg	1000 kg
Labour usage	300 man-hours	250 man-hours
Electric energy consumption	1000 kWh	1500 kWh
Cost of raw material/kg	Rs. 22	Rs. 33
Labour cost per man hour	Rs. 10	Rs. 10
Electric Energy/kwhr	Rs. 2.0	Rs. 2.0

Compare the productivity of material, labour and electrical energy in using materials A and B. Comment on the relative advantage of using either of the materials.

Solution $\text{Productivity} = \dfrac{\text{Value of Output}}{\text{Value of Input}}$

Sales value of output with material A

= Output of product X in unit's × rate/unit of X

+ output of product Y in unit's × rate/unit of Y

$= 200 \times 75 + 300 \times 35 = 15000 + 10{,}500 = 25{,}500$

Sales value of output with material B

$= 400 \times 75 + 200 \times 35 = 30{,}000 + 7{,}000 = 37000$

The partial productivity of different factors of production is as follows :

S. No.	Poductivity (type)	Material A	Material B
(1)	Productivity of raw materials $= \dfrac{\text{Sales value of output}}{\text{Value of raw material used}}$	$\dfrac{25{,}500}{1000 \times 22} = 1.16$	$\dfrac{37{,}000}{1000 \times 33} = 1.12$

(2)	Labour productivity $= \frac{\text{Sales value of output}}{\text{Value of labour used}}$	$\frac{25{,}500}{300 \times 10} = 8.5$	$\frac{37{,}000}{250 \times 10} = 14.80$
(3)	Productivity of energy $= \frac{\text{Sales value of output}}{\text{Value of electrical energy used}}$	$\frac{25{,}500}{1000 \times 2} = 12.75$	$\frac{37{,}000}{1500 \times 2} = 12.33$

Hence, we see that the productivities at (1) and (3) by using either material A or B are nearly the same. If labour is the key factor, use of material B is better as it yields higher productivity $14.8 > 8.5$.

PURPOSE AND BENEFITS OF INCREASING PRODUCTTVITY

For Management

(i) To earn good profit because of reduction in costs.

(ii) To sell more, to earn profit.

(iii) To have better utilization of resources.

(iv) To stand better in the market.

(v) Provide overall prosperity and reputation of the company

PURPOSE AND BENEFITS OF INCREASING PRODUCTTVITY

For Workers

(i) Higher wages.

(ii) Better working conditions, improved morale.

(iii) Higher standard of living.

(iv) Job security and satisfaction

PURPOSE AND BENEFITS OF INCREASING PRODUCTTVITY

For Consumers

(i) Better quality goods at reduced prices which helps to raise their standard of living.
(ii) More satisfaction.

To Government

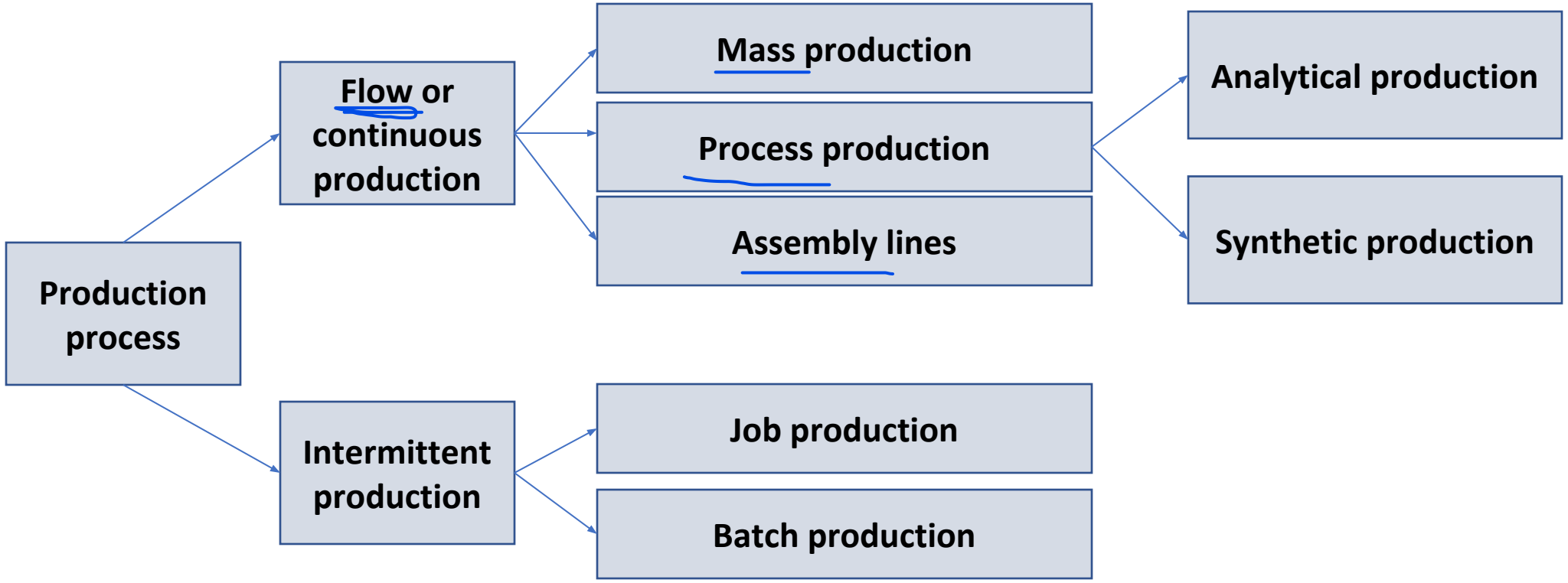
(i) Higher profits earned by factories will bring more revenue to the government by taxation.
(ii) Export trades may develop bringing more foreign exchange to the nation.
(iii) It helps to increase the welfare of the nation and development of national economy.
(iv) It helps better utilization of resources of the nation.
(v) It increases per capita income.
(vi) Development of the nation.

FACTORS AFFECTING PRODUCTIVITY

- Technological Development
  - Size of the Plant
  - Research and Development
  - Plant and Job Layout
  - Machine and Equipment Design
  - Production Process
- Individual factors
- Organizational factors
- Work Environment
- Other Factors
  - Natural Factors
  - Managerial Factors
  - Government policy

PRODUCTION SYSTEMS

TYPES OF PRODUCTION SYSTEMS



TYPES OF PRODUCTION SYSTEMS

FLOW PRODUCTION

- It is most useful for product of repetitive nature.
- Each work is passed to the next stage immediately after the previous operation is completed without waiting for the finishing of work as a total batch.

TYPES OF PRODUCTION SYSTEMS

FLOW PRODUCTION

- **Mass Production**

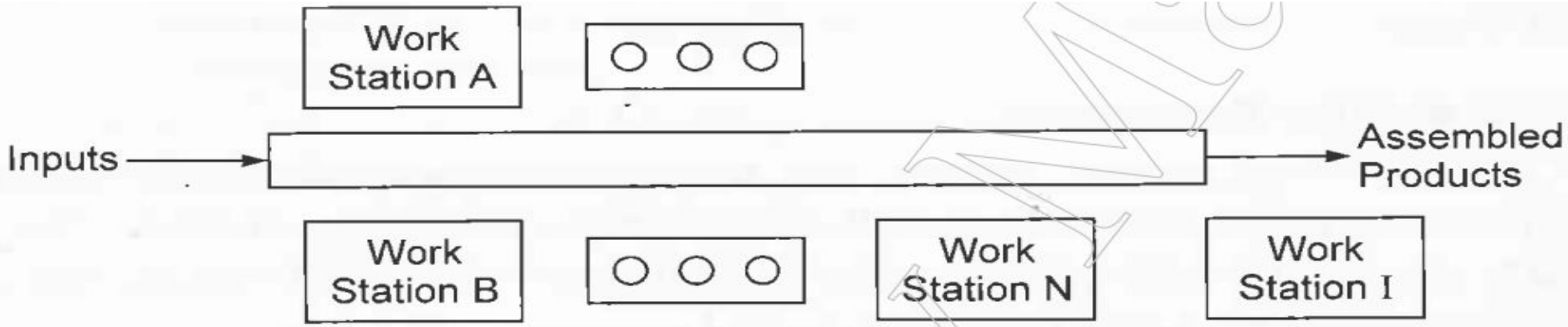


Fig. (4) Mass Production

Mass production system is employed when production is carried out without interruption. For example : automobiles plant, electronics industry type industry, electricals, etc. Quality of products tend to be uniform and high due to standardization and mechanisation.

TYPES OF PRODUCTION SYSTEMS

FLOW PRODUCTION

- **Process Production**
  - Various processes are inter linked and production is carried on continuously through a uniform and standardized sequence of operations This type of production is used in bulk processing of crude oil into petroleum, kerosene and diesel etc.

(a) Analytical Process : Here a raw material is broken down into different products. For example, crude oil is analyzed into gas, petrol, kerosene and diesel oil as shown in fig. (5).

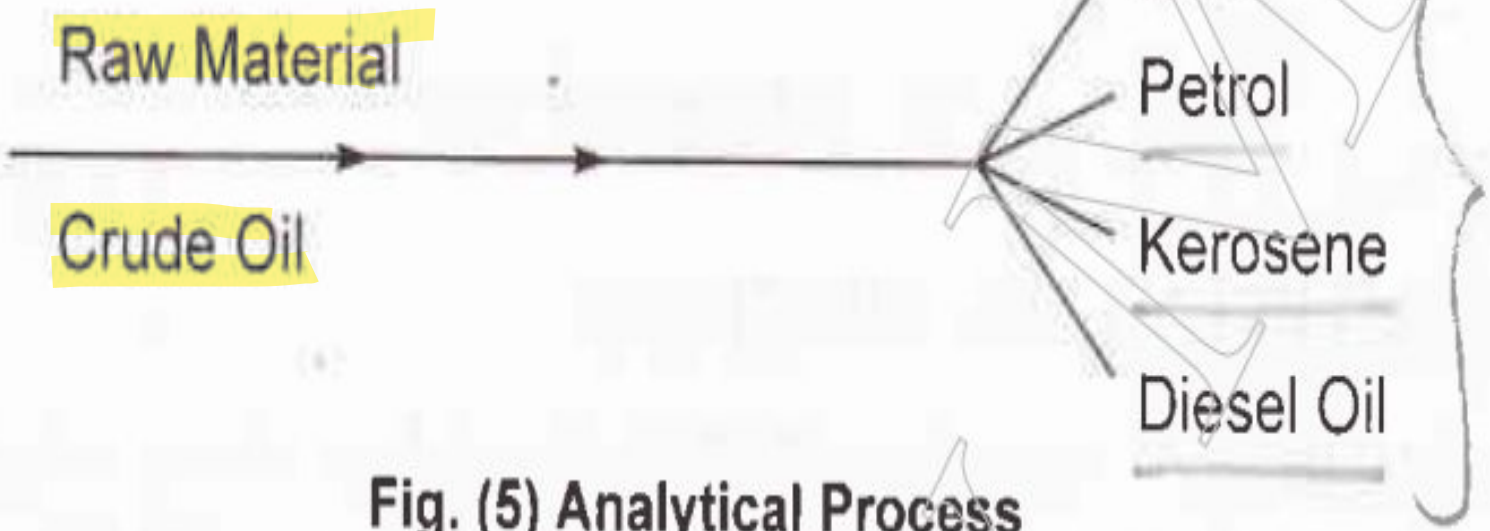


Fig. (5) Analytical Process

* One to many

(b) Synthetic Process : It involves the mixing of two or more materials to manufacture a product. For example, lauric acid, myristic acid, plasmitic acid, stearic acid, linoleic acid are synthesized to manufacture soap as shown in fig. (6).

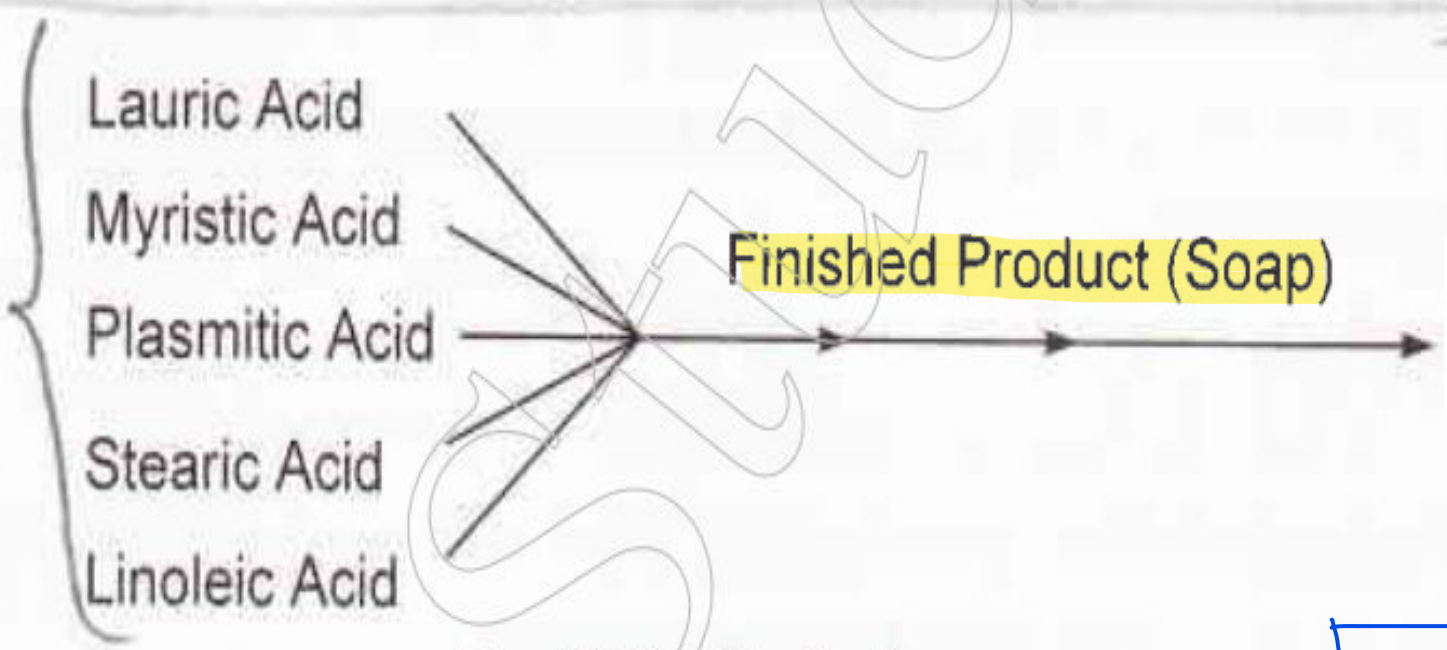


Fig. (6) Synthetic Process

* Many to one

(3) Assembly Lines

It was developed in the automobiles industry in USA. Here two or more components are combined to manufacture a finished product as shown in fig. (7). Assembly line is particularly useful when a limited variety of similar products is to be produced on a mass scale or in fairly large batches on a continuous basis. The design of assembly line involves the proper balancing of technology and other manufacturing facilities so as to develop a rational approach of optimization of results.

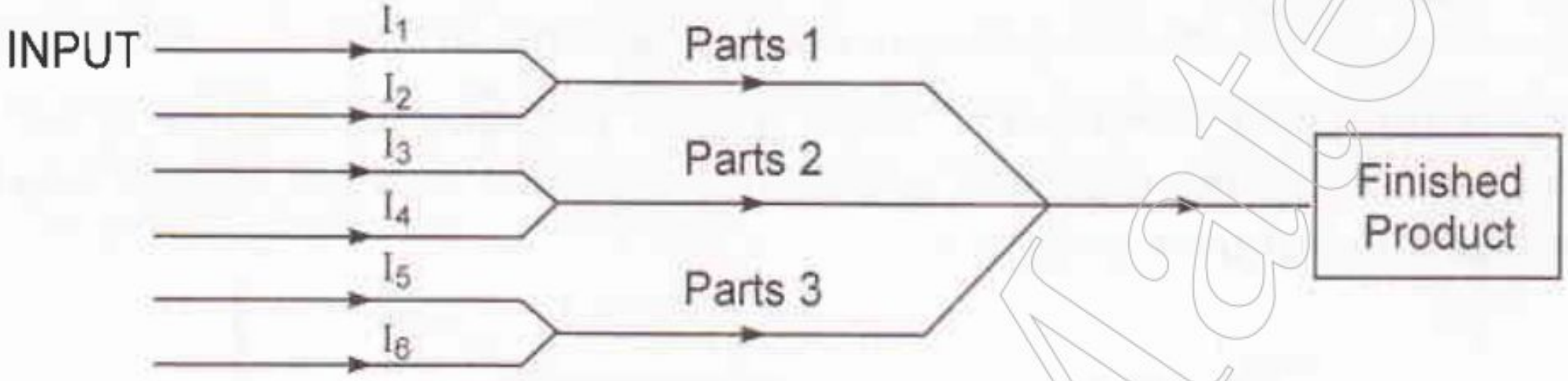


Fig. (7) Assembly Line

TYPES OF PRODUCTION SYSTEMS

INTERMITTENT PRODUCTION Here the production is not continuous and designed only when it is required.

Job Production

- Job or 'make complete' production
  - Bridge building, dam construction, ship building etc.

Batch production

- Production based on specific order or on the basis of demand forecast.