FRANKLIN'S LECTURES

INDUSTRIAL ECONOMICS & FOREIGN TRADE

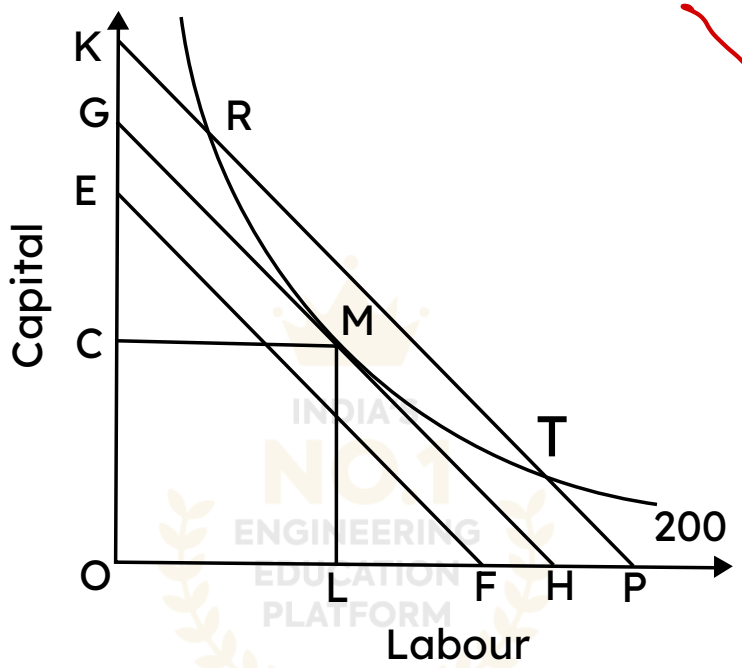
Module 2 | Part 2

HUT300

PRODUCER'S EQUILIBRIUM / LEAST COST COMBINATION

(Also known as **Optimal Input Combination**)

A producer reaches equilibrium when they **produce a given level of output at the minimum cost**, or maximize output with a given cost — by choosing the right combination of Labour (L) and Capital (K). It is attained at the point where the isoquant curve is tangent to an iso-cost line.



The iso-cost line GH is tangent to the isoquant 200 at point M. The firm employs the combination of OC of capital and OL of labour to produce 200 units of output at point M with the given cost-outlay GH. At this point, the firm is minimising its cost for producing 200 units.

Any other combination on the isoquant 200, such as R or T, is on the higher iso-cost line KP which shows higher cost of production.
The iso-cost line EF shows lower cost but output 200 cannot be attained with it.
Therefore, the firm will choose the minimum cost point M which is the least-cost factor combination for producing 200 units of output.

Thus the equilibrium condition

$$W/r = MP_L/MP_K = MRTS_{LK}$$

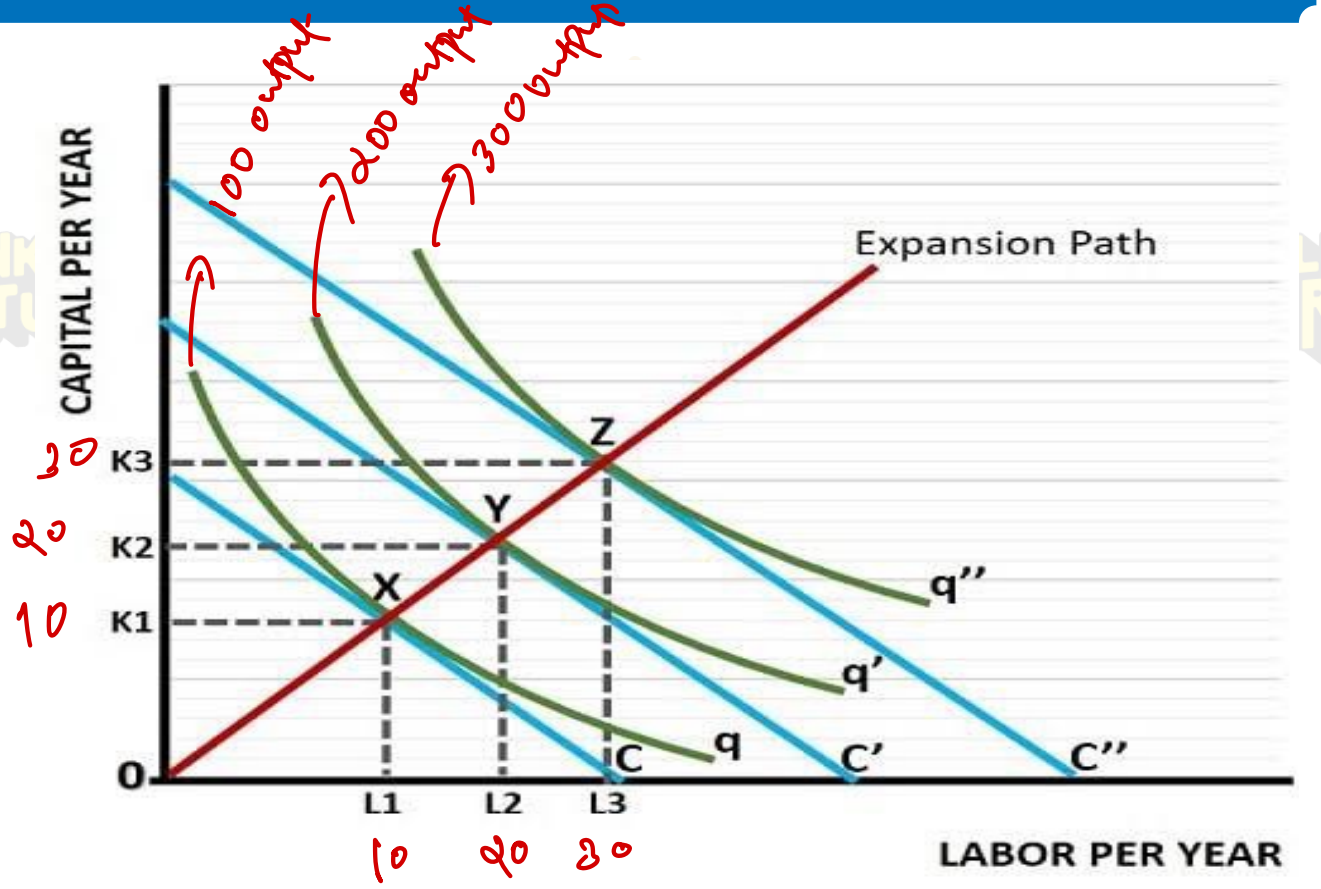
Marginal Rate of Technical Substitution

MRTS → 2
1 unit Labour ↑
2 unit capital ↓

EXPANSION PATH

Expansion path is a line connecting optimal input combinations as the scale of production expands. In other words, it gives the least cost inputs combinations at every level of output. It is a long run concept. We can obtain the expansion path by joining the point of tangency between isoquants and isocost lines of a firm It is a line or a curve on which every point is an equilibrium point. All these points indicate minimum cost combinations of two factors at various levels of output. Expansion path shows the path on which a rational producer would prefer to increase scale of production in his firm.

With the help of a diagram, explain producer's equilibrium and expansion path. (7)



Q. Define expansion path (3) (Dec 2022).

Explain producer's equilibrium with the help of an isoquant and isocost line. (7)
(Dec 2022)

TECHNICAL PROGRESS

Technical progress refers to an improvement in the methods of production that allows more output to be produced with the same amount of inputs, or the same output with fewer inputs. It is a key driver of economic growth and productivity. In other words there will be a downward shift of the isoquant which implies that same output is produced with lesser quantities of inputs

Technical progress may be embodied and disembodied. It is embodied or investment specific when new capital (machinery) is used in the production process. It is disembodied or investment neutral, when output increases without any increase in investment but by an innovation through research.

There are three types of technological progress:

1. Neutral technical progress:

It is neutral when change in the marginal product of labour and capital are same due to the technical progress. In this case there will be a parallel downward shifting of the isoquant. In this case slope of the isoquant or MRTS LK remains the same. In other words, there is an equal reduction in both the inputs in the production of a certain quantity of output.

2. Labour Augmenting Technical Progress:

It means the marginal product of labour increases faster than the marginal product of capital. Here, the new isoquant becomes more steeper.

MRTS will be high

MRTS → 4

3. Capital Augmenting Technical Progress:

It means the marginal product of capital increases faster than the marginal product of labour. In this case, the new isoquant becomes more flatter

MRTS will be low

MRTS → 0.25

What do you mean by labour augmenting technical progress? (3)
(Dec 2022)

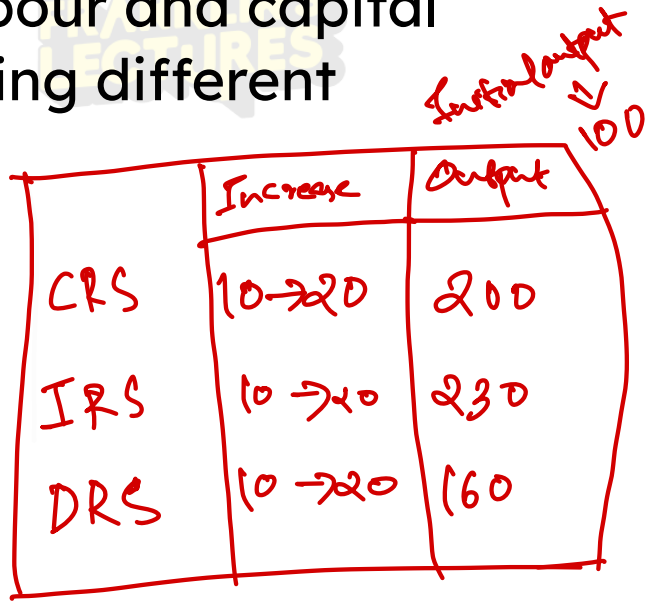
COBB-DOUGLAS PRODUCTION FUNCTION

- The **Cobb-Douglas Production Function** is a mathematical model that shows the relationship between **inputs (Labour and Capital) and output.**
- **The** Cobb–Douglas form was developed and tested against statistical evidence by Charles
- **Cobb and Paul Douglas between 1927–1947; according to Douglas,** the functional form
- itself was developed earlier by Philip Wicksteed.

$$Q = A \cdot L^{\alpha} \cdot K^{\beta}$$

Where:

- Q = Output
- L = Labour
- K = Capital
- A = Total Factor Productivity (technology factor)
- α **(alpha) and** β **(beta)** = Output elasticities of labour and capital
- It shows how much output we can produce by using different amounts of labour and capital.
- If α + β = 1, it means **constant returns to scale.**
- If α + β > 1, then **increasing returns to scale.**
- If α + β < 1, then **decreasing returns to scale.**



Given below is the production function of firm A.
Q = 2L^0.25 K^0.75.
The firm uses 5 units of labour (L) and 5 units of capital (K). Calculate the output.
If we reduce L by 10%, how much would K need to be increased to produce the same output? (3)

(Dec 2023)

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$Q = 2 \times 5^{0.25} \times 5^{0.75}$

$= 2 \times 5^{0.25+0.75}$

$2 \times 5^1 = 10$ units

$\alpha = 0.25 \rightarrow$ 1% change in labour $\rightarrow$ 0.25% change in output

$\beta = 0.75 \rightarrow$ 1% change in capital $\rightarrow$ 0.75% change in output

Output elasticity of labour

Output elasticity of capital

Labour decreases by 10%.

$(-)10\% \times 0.25 \Rightarrow (-)2.5\%$

$0.75 \times x = {}^{+}2.5\%$

$x = \frac{2.5}{0.75} = 3.33\%$

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THANK YOU