



Theory of Cost





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What is Cost and Cost Function?

A cost is an expenditure required to produce or sell a product or get an asset ready for normal use. In other words, it's the amount paid to manufacture a product, purchase inventory, sell merchandise, or get equipment ready to use in a business process.

The cost function describes the least cost of producing each level of output given prices of factors of production and technology.

In short, it is the relation between cost and output.

Short Run Costs

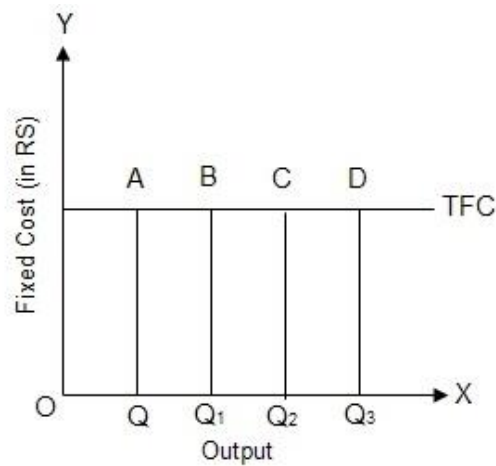
In the short run, some of the factors of production cannot be varied, and therefore, remain fixed.

Total Fixed Cost

Fixed costs refer to those costs which do not vary directly with the level of output.

For example, rent of premises, interest on loan, salary of permanent staff, insurance premium etc.

Fixed cost is incurred on fixed factors like machinery, land, building, etc., which cannot be changed in the short run. The payment to these factors remains fixed irrespective of the level of output, i.e. fixed cost remains the same, whether output is large, small or even zero.



TFC curve is a horizontal straight line parallel to the X-axis because TFC remains same at all levels of output, even if the output is zero.

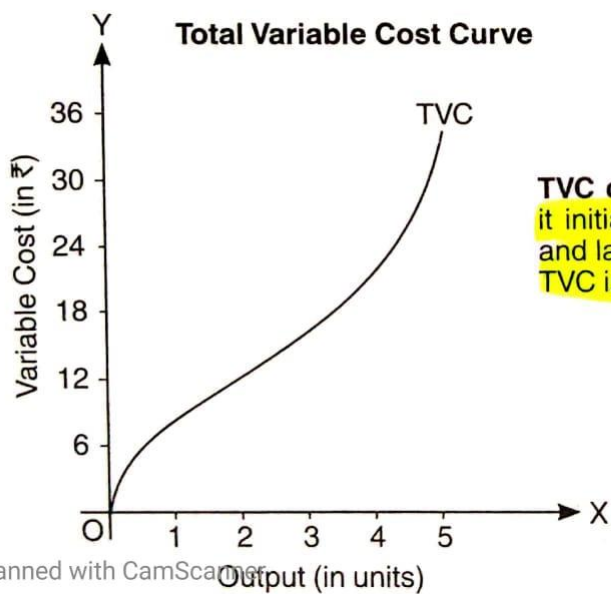
Variable Costs

Variable costs refer to those costs which vary directly with the level of output.

For example, payment of raw material, power, fuel, wages of casual labour, etc.

Variable costs rise with increase in the output and fall with the decrease in the output. Such costs are incurred till there is production and become zero at zero level of output.

Output	TVC
0	0
1	6
2	10
3	15
4	24
5	35



TVC curve starts from the origin indicating that when output is zero, variable cost is also zero. TVC is an inversely S-shaped curve due to Law of Variable Proportions.

TVC curve is inversely S-shaped

Initially TVC rises at a decreasing rate because of better utilisation of better fixed factor and increase in efficiency of variable factors

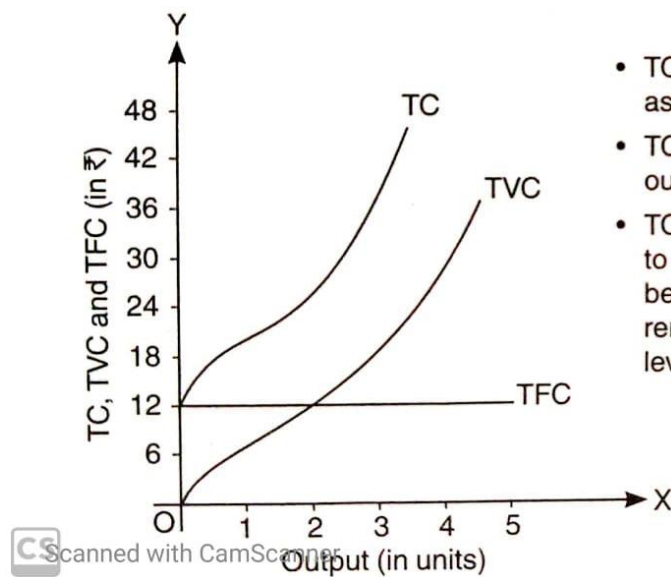
Total Cost

Total cost is the total expenditure incurred by a firm on the factors of production required for the production of a commodity.

$$TC = TFC + TVC$$

Since TFC remains same at all the levels of output, the change in TC is entirely due to TVC.

Output	TFC	TVC	TC
0	12	0	12
1	12	6	18
2	12	10	22
3	12	15	27
4	12	24	36
5	12	35	47



- TC curve is also inversely S-shaped as TC derive its shape from TVC.
- TC is equal to TFC (₹ 12) at zero output.
- TC and TVC curves are parallel to each other as vertical distance between them is TFC, which remains constant at all output levels.

Relationship between TC, TFC and TVC

- TFC curve is a horizontal straight line parallel to X-axis as it remains constant at all levels of output.
- TC and TVC curves are inversely S-shaped because they rise initially at a decreasing rate, then at a constant rate and finally, at an increasing rate. The reason behind their shape is Law of Variable Proportions.
- At zero level of output, TC is equal to TFC because there is no variable cost at zero level of output. So, TC and TFC curves start from the same point, which is above the origin.
- The vertical distance between TFC curve and TC curve is equal to TVC. As TVC rises with increase in the output, the distance between TFC and TC curves also goes on increasing.
- TC and TVC curves are parallel to each other and the vertical distance between them remains the same at all levels of output because the gap between them represents TFC, which remains constant at all levels of output.

Average Costs

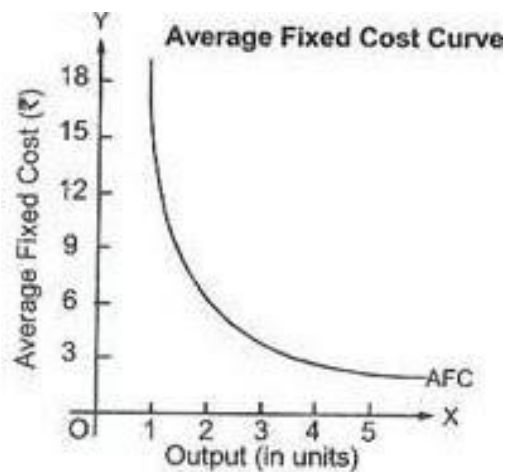
Average Fixed Cost: Average fixed cost refers to the per unit fixed cost of production.

It is calculated by dividing the TFC by total output.

$$AFC = TFC/Q$$

AFC falls with increase in output as TFC remain same at all levels of output.

Output	TFC	AFC
0	12	∞
1	12	12
2	12	6
3	12	4
4	12	3
5	12	2.40

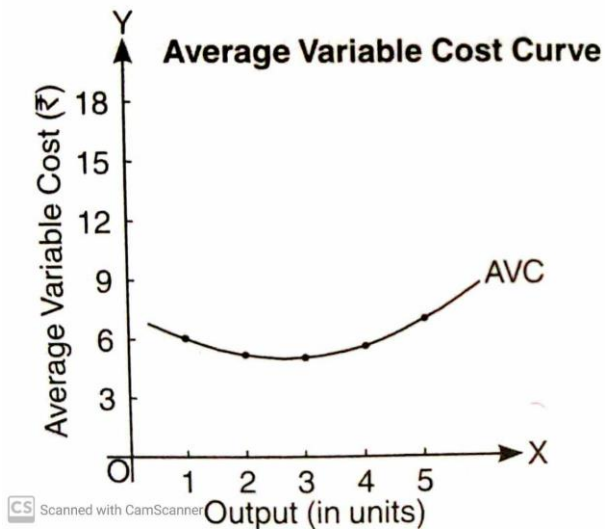


- AFC curve slope downwards as AFC falls with increase in output.
- AFC curve is a rectangular hyperbola, i.e., area under the curve remains same at all points.

Average Variable Cost: Average variable cost refers to the per unit variable cost of production. It is calculated by dividing TVC by total output.

$$AVC = TVC/Q$$

Output	TVC	AVC
0	0	-
1	6	6
2	10	5
3	15	5
4	24	6
5	35	7



AVC is a U-shaped curve as it initially falls and then remains constant for a while and finally, it starts increasing.

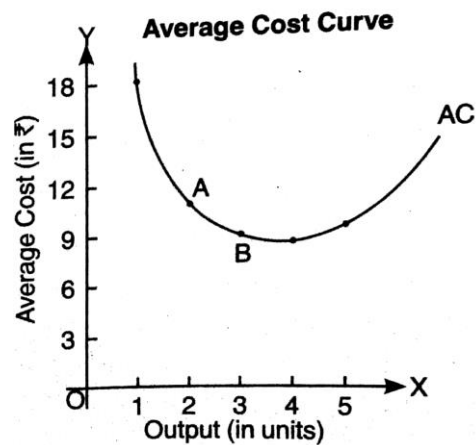
The 3 phases of AVC curve i.e. decreasing, constant and increasing phases correspond to the three phases of Law of Variable Proportions.

Average Total Cost: Average cost refers to the per unit total cost of production. It is calculated by dividing TC by total output.

$$AC = TC/Q$$

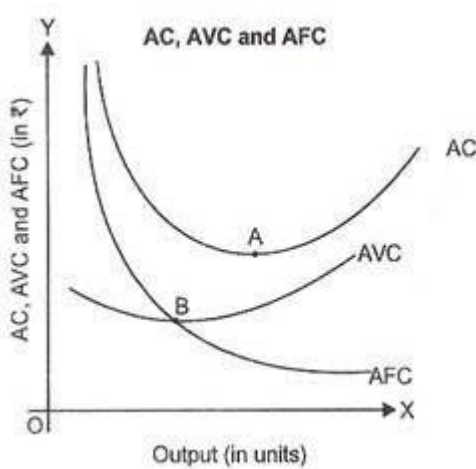
Average cost is also defined as the sum of average fixed cost and average variable cost.

Output	AFC	AVC	AC
0	∞	-	-
1	12	6	18
2	6	5	11
3	4	5	9
4	3	6	9
5	2.40	7	9.40



AC initially falls (1st phase), and after reaching its minimum point (2nd phase), it starts rising (3rd phase).

Relationship between AC, AVC and AFC



- AC curve will always lie above the AVC curve because AC, at all levels of output includes both AVC and AFC.
- AVC reaches its minimum point at a level of output lower than that of AC because when AVC is at its minimum point, AC is still falling because of falling AFC.
- As the output increases, the gap between AC and AVC curves decreases, but, they never intersect each other. It happens because the vertical distance between them is AFC, which can never be zero.

Marginal Cost

Marginal cost refers to addition to total cost when one more unit of output is produced.

$$MC_n = TC_n - TC_{n-1}$$

Where,

n = Number of units produced

MC_n = Marginal cost of n^{th} unit

TC_n = Total cost of n units

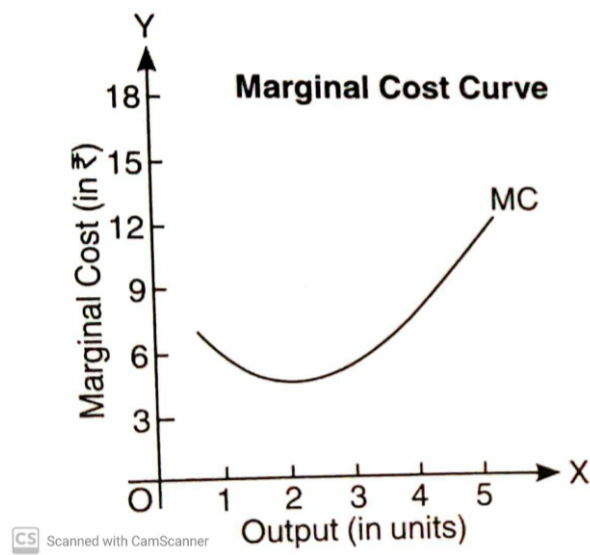
TC_{n-1} = Total cost of $(n-1)$ units

Also, MC = Change in total cost/Change in units of output

MC is not affected by fixed costs

MC is addition to TC (TFC + TVC) when one more unit of output is produced. As TFC does not change with change output, MC is independent of TFC and is affected only by change in TVC.

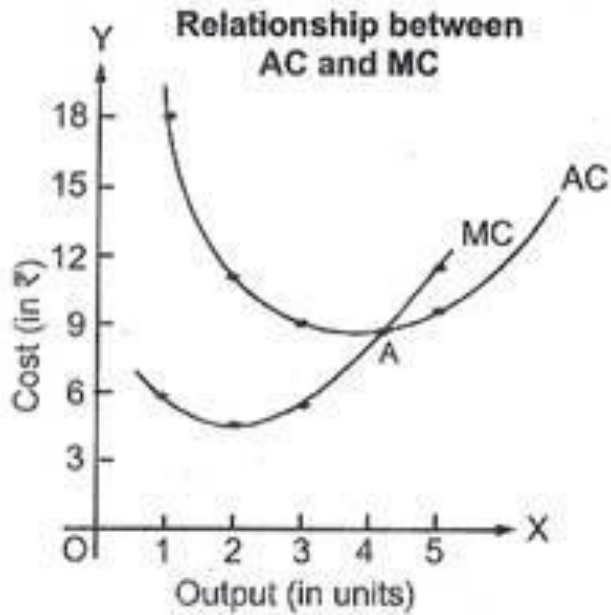
Output	TVC	TFC	TC	MC	MC
$TC_n - TC_{n-1} = MC_n$ $TVC_n - TVC_{n-1} = MC_n$					
0	0	12	12	-	-
1	6	12	18	6	6
2	10	12	22	4	4
3	15	12	27	5	5
4	24	12	36	9	9
5	35	12	47	11	11



MC initially falls till it reaches its minimum point and, thereafter, it starts rising. The reason behind its U-shape is the law of variable proportions.

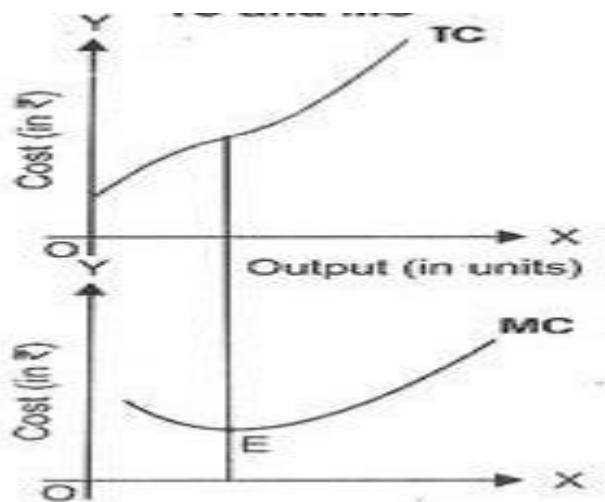
Relationship between AC and MC

Output	TC	AC	MC	Phase
0	12	-	-	I ($MC < AC$)
1	18	18	6	
2	22	11	4	
3	27	9	5	
4	36	9	9	II ($MC = AC$)
5	47	9.40	11	III ($MC > AC$)



- When MC is less than AC, AC falls with increase in the output.
- When MC is equal to AC, AC is constant and at its minimum point.
- When MC is more than AC, AC rises with increase in output.
- Thereafter, both AC and MC rise, but MC increases at a faster rate as compared to AC. As a result, MC curve is steeper as compared to AC curve.

Relationship between TC and MC



- Marginal cost is addition to total cost, when one more unit of output is produced.
- When TC rises at a diminishing rate, MC declines.
- When the rate of TC stops diminishing, MC is at its minimum point.
- When the rate of increase in total cost starts rising, the MC is increasing.

Long Run Costs

In long run all factors are assumed to become variable.

Average Cost Curve

Long run cost curve is a planning curve, in the sense that it is a guide to the entrepreneur in his decision to plan the future expansion of its output.

The long run average cost curve is derived from short run costs curves. Each point on the LAC corresponds to a point on a short-run cost curve, which is tangent to the LAC at that point.

Derivation of LAC

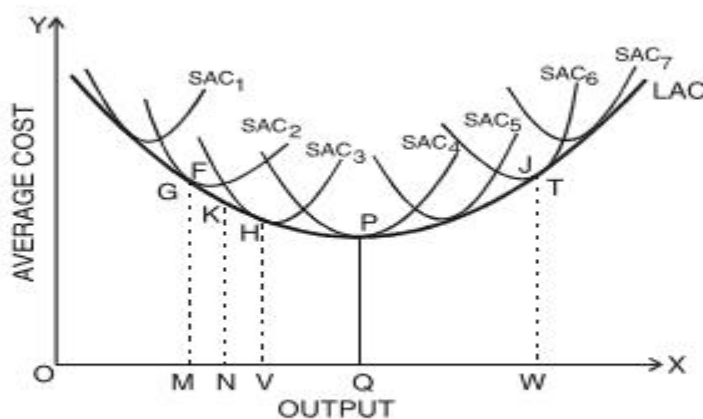


Fig.2 : Long run Average Cost Curves

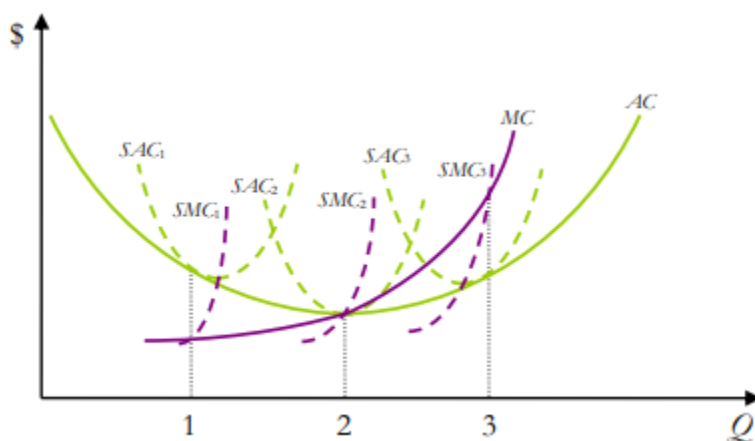
LAC is often known as 'envelop curve' because it envelops the short run cost curves.

- The U-shape of the LAC reflects the laws of returns to scale. According to these laws the units costs of production decrease as plant size increases, due to the economies of scale which the larger plant sizes make possible.

- The economies of scale exists only up to certain size of plant, which is known as the optimum plant size, because with this plant size all possible economies of scale are fully exploited.
- If the plant increases further than this optimum size there are diseconomies of scale, arising from managerial inefficiencies.
- Thus at the falling part of the LAC the plants are not worked to full capacity and at the rising part of LAC plants are overworked. Therefore, only at the minimum point (P) is the plant optimally employed.

Marginal Cost Curve

The long run marginal cost curve is derived from the SRMC curves, but does not envelop them.



The LMRC is formed from points of intersection of SMRC curves with vertical lines drawn from the points of tangency of corresponding SAC curves and LRA cost curve.

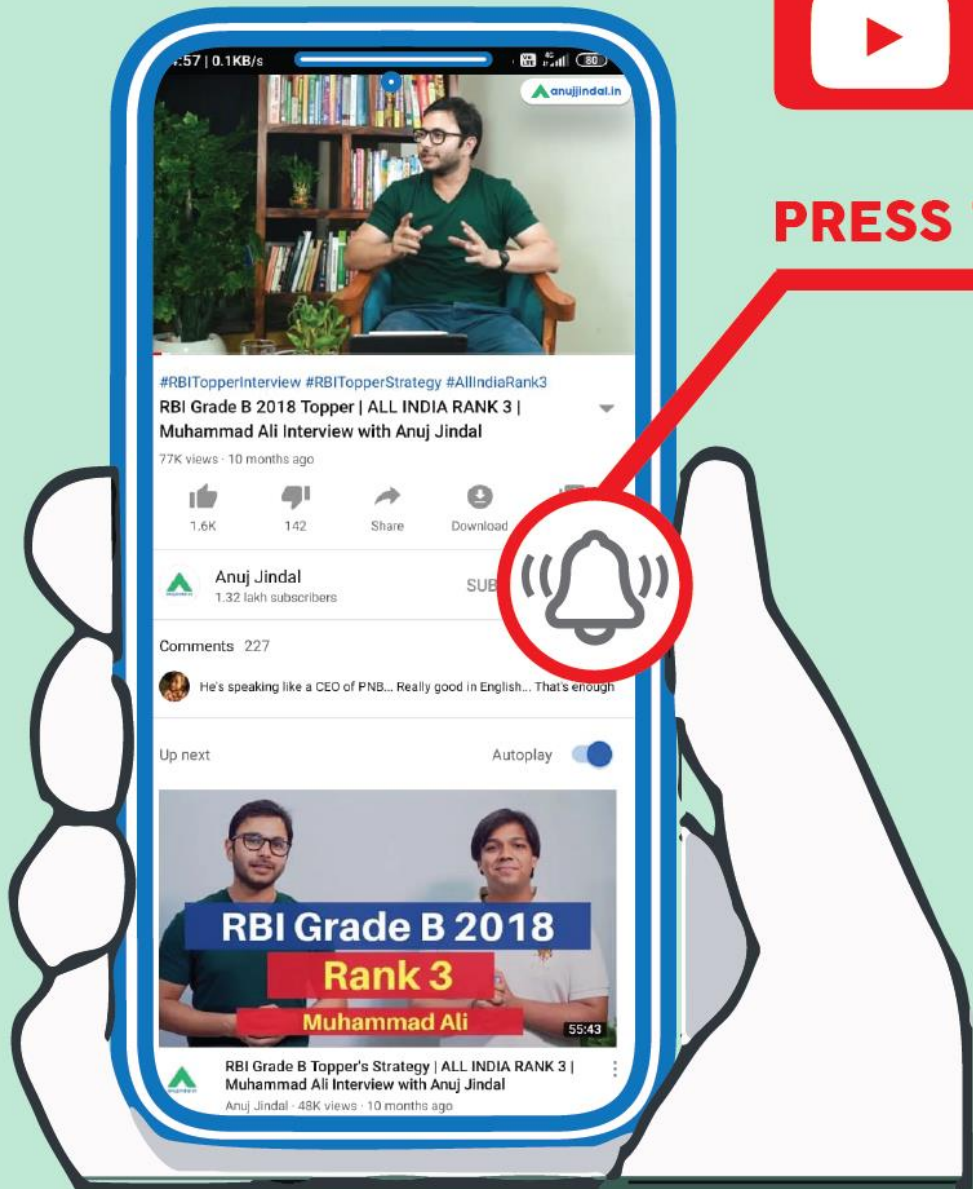
The LMC must be equal to the SMC for the output at which the corresponding SAC is tangent to the LAC.



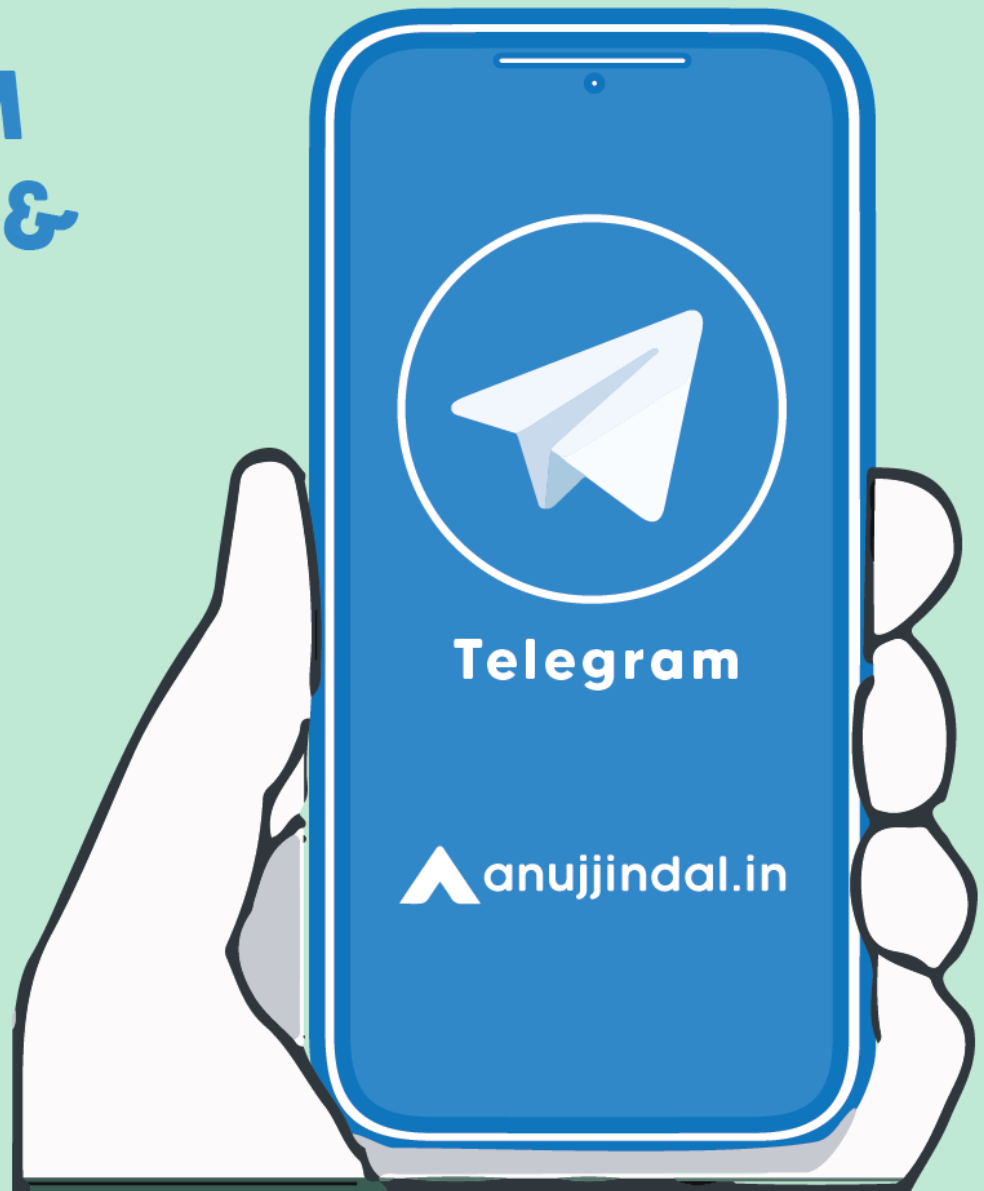
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Cleared RBI Grade B

Sanjay Meena



Cleared RBI Grade B

Yash Gupta



Cleared RBI Grade B

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Cleared SEBI

Gopika Jayan



Cleared SEBI

Vasant Kesari



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JRF with 96.92 Percentile

Vaishali Jadon



NET with 89.27 Percentile

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