Tutorial 5 - Perfect Competition

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PROBLEM 1

A firm's total cost function is given by the equation:
$TC = 16000 + 20Q + 40Q^2$

Based on the TC function above, write the value or the expression (formula) for each of the following cost measures:

Average total cost (ATC)
Fixed cost (FC)
Average fixed cost (AFC)
Variable cost (VC)
Marginal cost (MC)

Please explain how to determine the quantity that minimizes the average total costs and calculate it.

SOLUTION

Average total cost (ATC) = $(16000 + 20Q + 40Q^2) / Q$
Fixed cost (FC) = 16000
Average fixed cost (AFC) = 16000/Q
Variable cost (VC) = $20Q + 40Q^2$
Marginal Cost (MC) = 20 + 40Q

b. ATC is minimized where MC = ATC:
Equating MC to ATC yields:
$(16000 + 20Q + 40Q^2) / Q = 20 + 80Q$
$16000 + 20Q + 40Q^2 = 20Q + 80Q^2$
$16000 = 40Q^2$
$400 = Q^2$
Q = 20
So, ATC is minimized at 20 units of output.

PROBLEM 2

If marginal cost is > average total cost, what will be the behavior of the average total cost? In such a situation we will have economies or diseconomies of scale?

SOLUTION

When MC > ATC ⇒ **ATC is rising.**

That is due by the fact that the cost of producing an additional unit of the good will be higher than the average total cost per unit of output already realized.
This makes the average total cost increase.

In this case we can say that we are observing diseconomies of scale, because the increase of units of output makes my average total costs increase (The ATC curve is upward sloping)

PROBLEM 3

The Carter Enterprise that produces cutlery wants to assess which is the right level of production that will allow it to minimize its average production costs in order to make its business more efficient.
The use of the plant and the machineries costs 250.000$ while for each unit produced the cost to be substained is $50Q + 100Q^2$

a)Which is the cost function for the Carter Enterprise?

b)Calculate fixed costs, average fixed costs, variable costs and marginal costs for the production function of Carter enterprise.

c)How can we determine the quantity to be produced in order to minimize costs?

d)Calculate the quantity that minimizes the average total costs.

SOLUTION

a) The cost function for Carter Enterprise is: $250000 + 50Q + 100Q^2$

b) Fixed Costs = 250000
Variable Costs = $50Q + 100Q^2$
Average Total Costs = $(250000 + 50Q + 100Q^2)/Q$
Marginal Costs= $50 + 200Q$

c) To determine the quantity to be produced in order to minimize the average total costs we have to calculate the quantity that makes marginal costs equal average total costs.

$(250000 + 50Q +100Q^2) /Q = 50 + 200Q$
$250000 + 50Q +100Q^2 = 50Q + 200Q^2$
$250000 = 100Q^2$
$2500 = Q^2$
$Q = 50$
So, ATC is minimized at 50 units of output.

PROBLEM 4

Define what is meant by “economies of scope” and “economies of scale”.

Calculate the degree of economies of scope for DELTA enterprise obtained by producing jointly 1000 Belts and 1000 Shoes given that their joint production function is:

C(B,S)= 64000 + 40B + 20S

Derive the individual production function.

SOLUTION

By “economies of scope” we mean the cost reduction obtained by the joint production of two goods. If producing the goods together yields a reduction in costs compared to the separate production of the same goods we can say we have an economy of scope.

By economies of scale we mean the average total cost decreases as the quantity produced increase.

C(B)= 64000 + 40B

C(S)= 64000 + 20S

C(B,S)= 64000 + 40*1000 + 20*1000 = 124000

C(B) + C(S) = 64000 + 40B + 64000 + 20S = 64000 + 40*1000 + 64000 + 20*1000 =

=104000 + 84000 = 188000

The degree of economies of scope is given by:

[C(B)+C(S) – C(B,S)]/C(B,S) = (188000-124000)/124000 = 51,6%