Assignment-3

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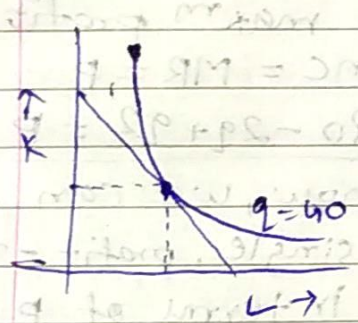
Q1 (i) input prices: $w = 4$, $r = 1$ | prodⁿ fun: $q = 4K^{0.5}L^{0.5}$

→ Now, we will find least cost input combination required for $q = 40$



∴ for minⁿ cost,
Slope of iso-cost line = slope of isoquant

∴ On simplifying we get,

$$\frac{MP_L}{w} = \frac{MP_K}{r}$$

where, $MP_L = \frac{0.5q}{L}$ and $MP_K = \frac{0.5q}{K}$

$$\therefore \frac{0.5q}{L \times w} = \frac{0.5q}{K \times r} \Rightarrow \frac{1}{L \times 4} = \frac{1}{K \times 1}$$

$$\therefore \boxed{K = 4L}$$

now, $q = 4K^{0.5}L^{0.5}$

$\therefore 40 = 4(4L)^{0.5}(L)^{0.5}$

$10 = 2L \therefore \boxed{L = 5}$

and, $K = 4 \times 5 = \boxed{20 = K}$

and, minimum cost $= wL + rK$
$= (4 \times 5) + (1 \times 20) = 20 + 20 = \boxed{40}$

→ so, $C = 40$, is the minimum cost and required input combination is $L = 5$, $K = 20$ units.

(ii) now, we suppose that $K = 16$ units = fixed capital

∴ to produce same $q = 40$, now we will need more labour, and cost, and we can find it as below:

$q = 4K^{0.5}L^{0.5}$

$\therefore 40 = 4 \times (16)^{0.5} L^{0.5}$

$\therefore \underline{L = 6.25 \text{ units}}$

and $C = (4 \times 6.25) + (1 \times 16)$

$\underline{C = 25 + 16 = 41 \text{ units}}$

∴ fixing capital at 16 units have given rise to below implications:

(*) labour usage increased from 5 units to 6.25 units

(*) and total cost increased from 40 units to 41 units.

(iii) Now, suppose goverment has offered firms subsidy of 2 $/unit, which has reduced w from 4 to 2 units and $q = 60$ is the new production qty to be.

(P.T.O.)

assumed as given in the question.

∴ our new ~~eq~~ input combination which minimizes cost can be found with our formula:

$$\frac{MP_L}{w} = \frac{MP_K}{r}$$

$$\therefore \frac{0.5q}{L \times w} = \frac{0.5q}{K \times r}$$

$$\therefore \frac{1}{L \times 2} = \frac{1}{K \times 1} \quad \therefore \boxed{K = 2L}$$

now, $q = 4K^{0.5} L^{0.5}$

$\therefore 60 = 4(2L)^{0.5} L^{0.5}$

$\therefore L = 10.61$ units,

and $\therefore K = 2L = 21.22$ units

∴ This subsidy resulted in labor or employment level increase from $L = 5$ to $L = 10.61$ units and increase in capital usage from $K = 20$ to $K = 21.22$ units

and minimum cost for this new production level of $q = 40$ can be found as,

$C = (2 \times 10.61) + (1 \times 21.22)$

$\therefore \boxed{C = 42.44}$ units.