ICSE 2017 Q8 b

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Question 21(a) A product can be manufactured at a total cost $C(x) = \frac{x^2}{100} + 100x + 40$, where x is the number of units produced. The price at which each unit can be sold is given by $P = 200 - \frac{x}{400}$. Determine the production level x at which the profit is maximum. What is the price per unit and total profit at the level of production?

Solution. Let the total price $p(x) = P.x$

$$\implies \frac{p(x)}{x} = 200 - \frac{x}{400} \tag{0.1}$$

$$c(x) = \frac{x^2}{100} + 100x + 40 \tag{0.2}$$

$$Profit = p(x) - c(x) \tag{0.3}$$

For maximum profit $\frac{dProfit}{dx} = 0$

$$\implies 100 - \frac{x}{40} = 0 \tag{0.4}$$

$$\implies x = 4000 \tag{0.5}$$

The total production level $x = 4000$
Price per unit $= P(x) = 190$

$$Profit = 199960 \tag{0.6}$$

Total profit = 199960

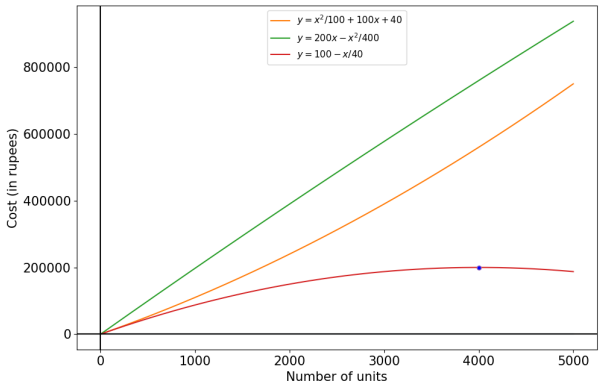

Fig. 0.1. Graph shows Total Profit, Total cost, Total profit with x

Symbol	Description	Value
P(x)	**Total Profit**	**760000**
P	**Profit per unit**	**190**
C(x)	**Cost per unit**	**560040**
x	**Number of units**	**4000**
Profit	**Total profit**	**199960**