Economics, Management and Entrepreneurship
Prof. Pratap K. J. Mohapatra
Department of Industrial Engineering & Management
Indian Institute of Technology – Kharagpur

Lecture - 11
Exercises on Economics (Contd.)

Good morning welcome to the 11th lecture on economics, management and entrepreneurship. We will devote today to certain more exercises, recall that on the 6th lecture we had done certain exercises on economics and today we shall carryout more such exercise on economics proper including those on breakeven analysis, costing et cetera. On whatever we have covered till the last lecture. We will cover today; we will take up 7 exercises.

(Refer Slide Time: 01:11)

Exercise 11

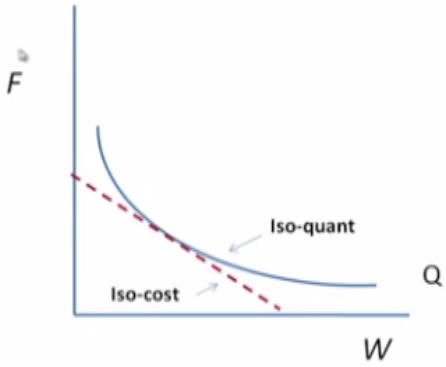
Staples Vegetable Farm is a potato grower. It estimates that potato output would increase by 600 kg with an additional 1,000 gallons of water provided to its irrigation system. Alternatively, potato output could be increased by 500 kg with an additional 2 tons of lime fertilizer.

a. Estimate the marginal products of water and fertilizer.
b. What is the marginal rate of technical substitution between these inputs?

The first exercise is about a staples vegetable farm who is a potato grower, it estimates that potato output would increase by 600 kg with an additional 1,000 gallons of water provided to it is irrigation system. Alternatively, potato output could be increased by 500 kg with an additional 2 tons of lime fertilizer. So as you can see from this exercise, 2 inputs are there and they are in a way substitutable, water and fertilizer.

The problem is to estimate the marginal products of water and of fertilizer, also to find out marginal rate of technical substitution between these inputs. This particular exercise and the next exercise will require recalling our knowledge about marginal product and marginal rate of technical substitution. Therefore, I give this diagram once again which is relevant to this particular exercise which is showing fertilizer here in the y axis and water in the x axis.

(Refer Slide Time: 02:35)



$$\frac{dF}{dW} = \frac{\partial TC}{\partial W} / \frac{\partial TC}{\partial F} = \frac{P_W}{P_F} = \left[\frac{dQ}{dW} / \frac{dQ}{dF}\right] = \frac{MP_W}{MP_F}$$

Now for different combinations of fertilizer and water that will give the same quantity of potato is the iso-quant line, whereas this is the iso-cost line that is on any point fertilizer cost and water cost would be the same as water cost and fertilizer cost here. Now recall that we had taken dF/dW, which is the marginal rate of technical substitution = del TC/del W / del TC/del F so that dF comes here dW remains in the denominator.

And this nothing but rise of water del TC total cost against increment in water is price of water / price of fertilizer and this is also = dF/dW which is the slope of this line basically iso-cost line which is also the slope of iso-quant line at this point. So that is equal to dQ/dW / dQ/dF this dQ/dF says the increment in Q for an increment in W which is called marginal product of water.

Divided by dQ/dF, the change in Q for a change in F that is marginal product of price. So this information we would like to once again recall so as to be able to solve this exercise 11 and the next exercise which is also about similar problem.

(Refer Slide Time: 04:53)

Solution

a.

Marginal product of water is given by $MP_{water} = \frac{600}{1000} = 0.6$ kg/gal

Marginal product of fertilizer is given by $MP_{fert} = \frac{500}{2} = 250$ kg/t

b.

Marginal rate of technical substitution =

$$\frac{dfert}{dwater} = -\left[\frac{dQ}{dwater} / \frac{dQ}{dfert}\right] = -\frac{MP_{water}}{MP_{fert}} = -\frac{0.6}{250} = -0.0024$$

$$\frac{\Delta_{fert}}{\Delta_{water}} = -0.0024 \Rightarrow \frac{\Delta_{water}}{\Delta_{fert}} = -416.6$$

It implies that one ton rise in fertilizer is associated with a reduction of 416.6 gallons of water.

Now 2 parts of this question, marginal product of water is straightforward it is MP water which is = dQ/dwater, dQ means change in amount of potato growth for additional amount of water given. So it is told in the question that 600 kg of potato would be additionally produced for 1000 gallon of water additionally given. So the marginal product of water is 0.6 kg per gallon straightforward.

And in the similar fashion marginal product of fertilizer is given by dQ/dfertilizer that is change in the potato production for change in the fertilizer and product. 2 tons of fertilizer gives rise to 500 kg of additional potato produced. So marginal product fertilizer is 250 kg per ton, so this is the first part of the question.

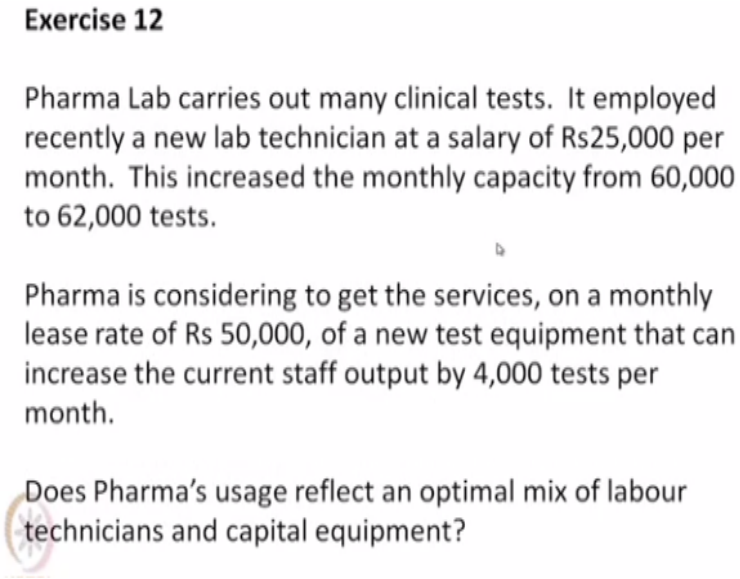
The second part of the question is, what is the marginal rate of technical substitution? That means at what rate water can substitute fertilizer or fertilizer can substitute water. This is given by dfertilizer/dwater which is same as dQ/dwater / dQ/dfertilizer and this is nothing but marginal product of water and this is nothing but marginal product of fertilizer.

And we have already estimated the value of marginal product of water as 0.6 kg/gallon so it appears in the numerator and for fertilizer it is 250, remember that this is always negative, is the case of technical substitution that means increase of 1 will decrease the extent of the other input used so it is negative here, therefore this is negative here, the value is - 0.0024.

So this is dfertilizer with dwater, this is if I take the inverse this case del of water/del of fertilizer is - 416.6, it implies that 1 ton rise in fertilizer is associated with a reduction of

416.6 gallons of water. That means if we apply 1 ton fertilizer more than our requirement of water will fall by 416.6 gallons. This information we are getting from the value of marginal rate of technical substitution. So this is exercise 11.

(Refer Slide Time: 08:16)

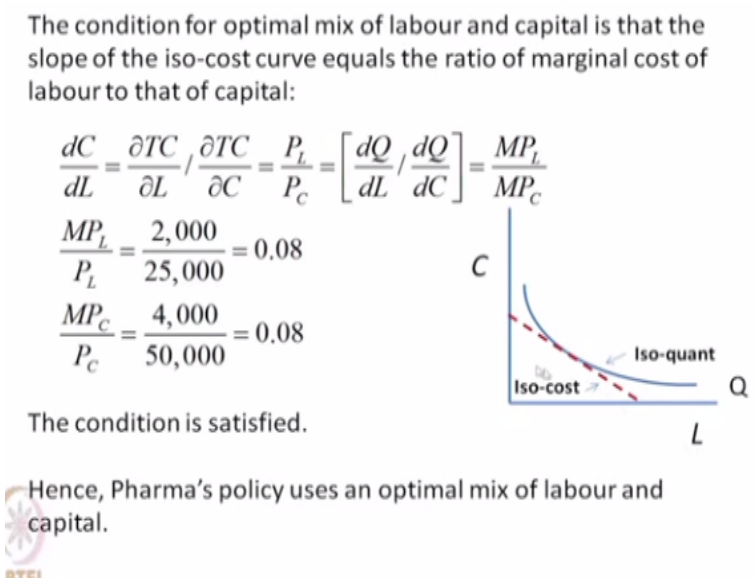


A similar exercise is given here in exercise 12. This is regarding the Pharma lab that carriers out many clinical tests. Recently it employed a new lab technician at a salary of rupees 25,000 per month. This increased the monthly capacity from 60,000 tests to 62,000 tests, that means there is an increase of 2000 tests because of employment of one new lab technician, but he is paid at a salary of rupees 25,000 per month.

Pharma is now considering to get the services on a monthly lease rate of rupees 50,000 of a new test equipment that can increase the current staff output by 4,000 tests per month. So this is another way of increasing the number of tests which was 2000 if a new lab technician is added where as if a new test equipment is purchased, then it is output will increase by 4,000 test per month, but the monthly expense to get the services is 50,000.

In fact it is not purchased but leased out, so monthly expense is rupees 50,000. The question is does the Pharma's usage reflect an optimal mix of labour technicians and capital equipment? Now here the number of tests carried out is the output and there are 2 inputs here, one is number of people employed and the other is the capital required.

(Refer Slide Time: 10:24)



So this diagram we once again draw, but this time we show labour and capital as the 2 axis as before this is iso-quant line and this is the iso-cost line and instead of fertilizer and water here we are using capital and labour, so same relationship or similar relationship, this is marginal product of labour/marginal product of capital = price of labour/price of capital.

Therefore MPL/PL = 2,000 number of tests because of the price of labour is 25,000 rupees additional salary, so this is 0.08 and MPc/Pc, MPc is the marginal product of the capital required divided by the price of the capital so 4,000 number of tests can be additionally performed if the new machine is leased out and the price paid for leasing out the new machine is 50,000 rupees per month and this ratio is also 0.08.

Therefore this condition is satisfied, because this condition is satisfied Pharma's policy now uses an optimal mix of labour and capital. It could operate here, it could operate here, but that the trend of the iso-quant line and that of the iso-cost line equal indicates that this is the optimal mix of labour and capital.

(Refer Slide Time: 12:29)

Exercise 13

A hotel has 100 rooms. The hotel is open for 200 days in a year. The room rent is Rs 100 per day. Two persons occupy a room. The costs of cleaning, laundry, and utilities are Rs. 20 per day per room. Total fixed cost of the hotel is Rs. 15,00,000 per year.

On an average, a person spends Rs 25 per day in the shops and Rs 50 per day in the restaurant owned by the hotel.

	Variable cost to volume ratio (%)	
	Shop	Restaurant
COGS	50	25
Supplies	5	15
Others	5	10

a. At what occupancy level will the revenue break even with the cost?
b. If the occupancy level is 70%, what is the annual profit?

Now after this we are going to question on breakeven analysis, cost volume profit analysis. This is an example from a service industry such as a hotel. A hotel has 100 rooms. It is open for 200 days in a year. The room rent is rupees 100 per day. 2 persons occupy a room. The costs of cleaning, laundry and utilities are rupees 20 per day per room. Total fixed cost of the hotel is rupees 15,00,000 per year.

On an average a person spends rupees 25 per day in the shops and rupees 50 per day in the restaurant owned by the hotel. The variable cost to volume ratio is given here, this is the cost of goods sold, in the shop it is 50, in the restaurant it is 25. For supplies it is 5 and 15 and for other variable costs it is 5 and 10. The question is at what occupancy level will the revenue breakeven with the cost?

The second part of the question, if the occupancy level is 70% what is the annual profit? Now this first of all says that the hotel has 100 rooms open for 200 days, but the occupancy level can vary. The question is what should be the % occupancy level, that is in a particular year, should it be 30%, 50%, 70% such that the revenue that the hotel gets breaks even with the cost of providing the services.

The hotel is getting out of not only room rent but also shops and restaurants. So various costs are given and the amount a person spends on an average in the shops and in the restaurant are also given, so one is we are asked to find out the occupancy level at which the breakeven occurs and if the occupancy level is 70% then what is the annual profit?

(Refer Slide Time: 15:50)

Solution

Let x be the average occupancy level.
Number of rooms occupied in a year
= (100 rooms)(200 day/year) (x) = 20,000x room-day/year

Revenue:

Rent: (20,000x)(100 Rs/room-day)	= 20,00,000x Rs/year
Shop: (20,000x)(2 person/room)(25 Rs/person-day)	= 10,00,000x Rs/year
Restaurant: (20,000x)(2)(50)100 Rs/room-day)	= 20,00,000x Rs/year
	50,00,000x Rs/year

Variable Cost:

Hotel: (20,000x)(20 Rs/room-day)	= 4,00,000x Rs/year
Shop: (100,000x)(0.5 + 0.05 +0.05)	= 6,00,000x Rs/year
Restaurant: (200,000x)(0.5)	= 10,00,000x Rs/year
	20,00,000x Rs/year

Break-even occupancy = $F/(p\text{-}v)$ = 15,00,000/(50,00,000-20,00,000)=50%
At 70% occupancy level, profit = (50,00,000 – 20,00,000)(.7) – 15,00,000
= 6,00,000 Rs/year

So first of all we assume the average occupancy level in a year be x, the number of rooms occupied in a year therefore is 100 rooms, 200 days per year * % occupancy so this is 20,000x room day per year. Now revenue the hotel gets out of 3 things, one is the rent, the other is spending from in the shops by the occupants of the rooms and from the restaurant.

Now room rent is given as 100 rupees per room per day and we have 20,000x room days per year. So if you multiply we get 20,00,000x rupees per year as rent from the occupants of the hotel. Now when we compare go to shops per room there are 2 persons and 1 person per day spends 25 rupees therefore per room we get 2 * 25 and there are 20,000x number of rooms therefore 20,000x * 25.

So that would be the revenue and that comes to 10,00,000x rupees per year revenue that the hotel gets from the spending of the occupants in the shop and in similar fashion we can find out about the restaurant. And that is 20,00,000 rupees per year and all these added to 50,00,000x rupees per year, so this is the revenue. Now we come to find out the variable cost.

The variable cost as it says it is the function of this 50, 5, 5 all these they are variable cost to volume ratio. Now we have 20,000 * x number of room day per year and in the hotel the variable cost is, first of all it is given is 20 rupees per day per room. The cost of cleaning, laundry and utilities are rupees 20 per day per room, how many rooms, room days are this so * 20 that is the variable cost for the hotel that comes to 4,00,000x rupees per year.

Now when we come to shop, it is 100,000x * 0.5 + 0.05 + 0.05, this 0.5 + 0.05 + this come from here basically 60 which is coming here as 0.6 and this comes to 6,00,000x rupees per year and in a similar fashion restaurant comes to 200,000x * 0.5 which is 10,00,000. The total variable cost is equal to 20,00,000x rupees per year.

Now the breakeven occupancy = the fixed cost/the contribution margin which is the unit price or revenue - the unit variable cost, so p – v and this is coming as 50%. F is given as fixed cost, fixed cost is given as here 15,00,000/50,000 – 20,000/x so this is the unit price, this is the unit variable cost so 50,00,000/30,00,000 = 50%.

This means that if the occupancy level is 50% then the total revenue equals the total cost both fixed and variable added, this means that the hotel should try to get more occupancy more than 50% occupancy to make profit. Now if the occupancy level is 70% then what we need to do is, this is the fixed cost to be subtracted.

This is the revenue * 0.7 – unit variable cost which is 20,00,000 * 0.07 so 50,00,000 – 20,00,000 that is p – v the contribution margin * 0.7 occupancy level that is the revenue minus the fixed cost that will give us the gross profit of 6,00,000 rupees per year. So this is an example of how to apply breakeven analysis. So the main thing here is to be able to find out the components of the variable cost, in this particular example.

In certain other examples one also has to find out the components of fixed cost as well, so the main thing is to classify the cost into 2 components, fixed and variable and then find out the breakeven volume where the total cost equals the total revenue.

(Refer Slide Time: 23:35)

Exercise 14

Gopal Steel Corporation provides you with the following miscellaneous data regarding its operation in 2011:

Break-even sales:	Rs.66,667
DM used:	24,000
Gross profit:	25,000
Contribution margin (CM):	30,000
Sales:	100,000
Variable FOH (VFOH):	5,000
DL:	28,000

Compute:

1. Fixed FOH (FFOH)
2. Variable selling and administrative expenses (VSAE)
3. Fixed selling and administrative expenses (FSAE)

Now we take up another example. This is an example that also talks about fixed cost and variable cost. Gopal Steel Corporation provides you with the following miscellaneous data regarding it is operation in the year 2011. Breakeven sales value is given as rupees 66,667; direct material used is 24,000 rupees, gross profit = 25,000 rupees, contribution margin is rupees 30,000, sales 100,000, variable factory overhead cost VFOH is 5,000 rupees, direct labour is 28,000 rupees.

We are required to find out the fixed factory overhead, variable selling and administrative expenses, fixed selling and administrative expenses. So in this example we are supposed to know how gross profit, contribution margin and breakeven sales are related with one another. Let us solve this problem.

(Refer Slide Time: 25:33)

Solution

Given
DM = 24,000 Rs, DL = 28,000 Rs, VFOH = 5,000 Rs
CM = 30,000 Rs

CM = Sales – Total variable costs
Total variable costs = 100,000 – 30,000 = 70,000 Rs
Total variable costs = DM + DL + VFOH + VSAE = 70,000 Rs
VSAE = 70,000 – (24,000 + 28,000 + 5,000) = 13,000 Rs
(Variable selling and administrative expenses)

Gross Profit = CM – Fixed FOH
25,000 = 30,000 – FFOH
FFOH = 5,000 Rs (Fixed factory overhead)

First of all what are given are the following, direct material is give as 24,000, direct labour is given, variable factory overhead is given and contribution margin is given. Now first contribution margin, what is contribution margin? Contribution margin is sales - the total variable costs only not the fixed cost and total variable costs are given here.

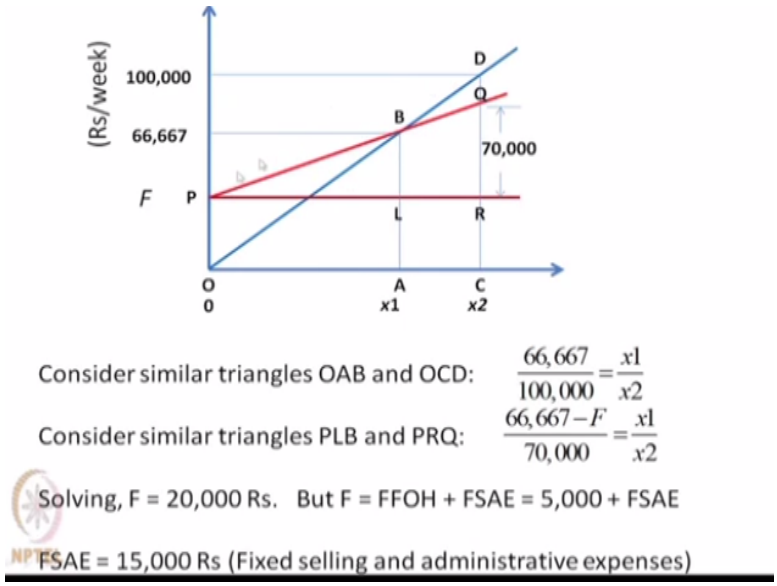
As direct material is the variable cost, direct labour is a variable cost and variable factory overhead is also a variable cost. So we add them 24 + 28 = 52, total variable cost. I am sorry there is another part of the variable cost which is the selling and administrative expenses that is not given therefore we cannot add this way, instead what we do, we find out total variable cost = sales – contribution margin, sales are given as 100,000.

Sales as given as 100,000 and contribution margin is given as 30,000. So since these 2 are given, we find out total variable cost as = sales – contribution margin that comes to 70,000 rupees. Now the total variable cost is not only these 3 which I have written down here, but also variable sales and administrative expenses which is not given, but now that we know variable cost as equal to 70,000.

Then these 3 being given, we can now find out variable selling and administrative expenses, this equal to 70,000 – these 3; 24 + 28 and 5, now that brings the value of VSAE as = 13,000 rupees. So we have been able to find out the value of variable selling and administrative expenses. Now gross profit is the contribution margin – fixed factory overhead.

Gross profit is given as 25,000 rupees, therefore CM, contribution margin is also given as 30,000, therefore 25,000 = 30,000 – fixed factory overhead. Therefore fixed factory overhead is = 5,000 rupees. So we have found out these values in this manner. Now we have found out the fixed factory overhead, but we are also required to find out the fixed selling and administrative expenses for that we need to use the information given to us on the breakeven sales.

(Refer Slide Time: 29:34)



This is the breakeven chart, the revenue, the fixed cost and the total cost. Now here, this is the breakeven point and this is the actual value at which the company is operating and it has made some profit. Now, if we consider the triangle OAB and triangle OCD they are similar triangles. Therefore, we can now look at this it says the breakeven sales is given as 66,667 whereas the actual sales is 100,000.

Look at this question, I will go back to the question. The question says the actual sales is 100,000 but the breakeven sales is rupees 66,667, so that is what I have shown here, at the breakeven point the sales are 66,667 where the actual sales that is the operating point here is 100,000 therefore I am considering these 2 triangles first, from here I can says that AB/CD = OA/OC, OA is I have said x1 and OC I have called it x2.

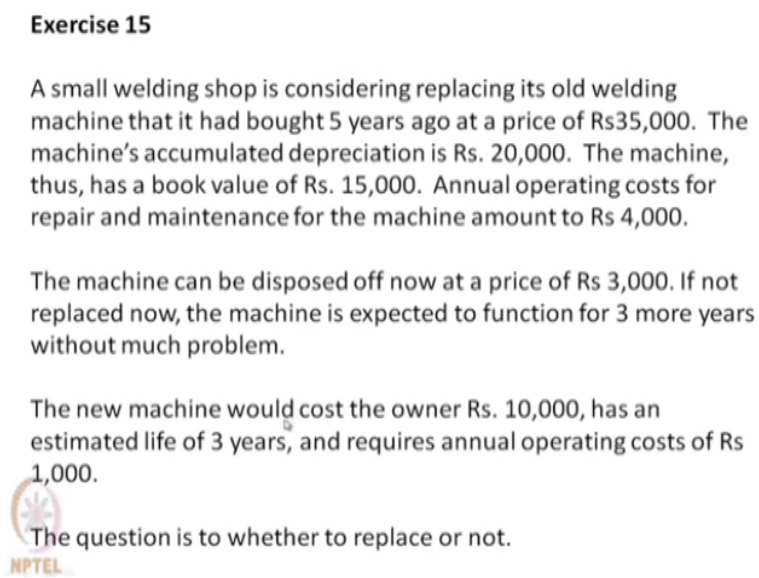
And this height is 66,000 and this height is 100,000. Therefore this by this is equal to x1/x2. Now consider similar triangles PLB and PRQ. So this triangle and this triangle are also similar and therefore BL/QR = PL/PR. PL is nothing but x1 and PR is nothing but x2. That is x1/x2 = BL/QR. What is BL? BL is 66,667 – fixed cost F/this height, this height is already known as 70,000 from our total variable cost 70,000. So this is 70,000. So x1/x2 = this by this, x1/x2 is also equal to this by this.

Therefore this is equal to this, if we solve we get F = 20,000, this is 20,000. This is the total fixed cost. Total fixed cost consists of fixed factory overhead expenses plus fixed selling and administrative expenses and fixed factory overhead expense we have already estimated as =

5,000. Therefore fixed selling and administrative expense is nothing but 20,000 – 5,000 which is = rupees 15,000 and this is the fixed selling and administrative expense.

So you can see from this example that various costs are related and one can solve for them in this manner. Now let us take exercise 15.

(Refer Slide Time: 34:14)



Exercise 15 is regarding a small welding shop. It is considering to replace it is old welding machine that it had bought 5 years ago at a price of rupees 35,000. The machines accumulated depreciation is rupees 20,000. The machine thus has a book value of rupees 15,000; 35,000 was the purchase price and in the last 5 years depreciation was accumulated as rupees 20,000.

So subtracting the accumulated depreciation from the purchase price with present book value of the machine is 15,000. We shall study more on depreciation later but for the time being we assume that the depreciation in the last 5 years is rupees 20,000 therefore the difference is what the book value of the welding machine is today, that is 15,000. The annual operating costs for repair and maintenance for the machine amount to rupees 4,000.

Now the machine can be disposed of now at a price of rupees 3,000, if not replaced now the machine is expected to function for 3 more years without much problem. The new machine would cost the owner rupees 10,000, it has an estimated life of 3 years and requires an annual operating cost of rupees 1,000. The question is whether to replace the machine or not, this is the total problem.

Now here the shopkeeper is facing 2 alternatives whether to keep the welding machine in it is existing condition or to replace it by a new machine.

(Refer Slide Time: 37:55)

Solution

The alternatives: 1. Keep the machine.
2. Replace the machine.

Irrelevant Costs

Past operating expenses, accumulated depreciation, and book value. They give no information about future and do not differ among alternatives.

	Keep the M/C	Replace the M/C
Operating cost (3 yrs)	Rs 12,000	Rs. 3,000
Disposal Value of the old machine	-	(3,000)
Cost of the new machine	-	10,000
Total Relevant Cost	Rs. 12,000	Rs 10,000

Decision: Replace the machine.

Now what are the relevant costs, the relevant costs are past operating expenses, the accumulated depreciation, and the book value. Please recall that the cost is considered relevant if it differs among the alternatives and it has future implications, past operating expenses of no future implications accumulated depreciation and also book value. They do not influence the future costs and they do not differ among the alternatives.

Therefore such information is irrelevant. Now we consider the 2 alternatives, keep the machine or replace the machine and these are the relevant costs. If we keep the machine the operating cost for 3 years is rupees 12,000 and if you are keeping it there are no disposal values and we are not buying the new machine therefore the total relevant cost for the 3 years is rupees 12,000.

And if we replace the machine then the operating cost of the new machine is 3,000, the cost of the new machine is 10,000 and we get 3000 rupees by selling the old machine. Disposal value of the old machine we get 3,000 rupees. So this is to be subtracted from here so 10 + 3 = 13 – 3 is the total relevant cost if you replace the machine is really 10,000; whereas if you keep the machine it is 12,000. So the decision is to replace the machine.

The annual operating cost of the new machine is rupees 1,000, whereas the annual operating cost of the old machine is rupees 4,000, so 4,000 x 3 = 12,000 for the operating cost of the new machine is 1,000 * 3 = 3,000 and this 3,000 is the amount that the shopkeeper will get by selling of it is old machine, so the total cost would be reduced by that amount, that is why this cancels out giving 10,000.

So the best policy here is to replace the machine. Now this problem says that certain costs like book value, depreciation, past operating expenses, they are not relevant and we have to consider the various alternatives and only the relevant costs are to be considered.

(Refer Slide Time: 41:31)

Exercise 16

Fancy Tools and Dies wishes to allocate its three service department costs to the operating departments. These service departments and their budgeted costs are:

Cafeteria: Rs 150,000, Engg: Rs 2,500,000, and Admin: Rs 950,000

Cafeteria employees worked 30,000 labour hours per year. There are 50 engineering employees with 100,000 total labour hours.

Operating Depts	No. of Employees	Engineering hours worked	Total Labour Hours
Machining	1000	50,000	250,000
Assembly	450	20,000	600,000
Finishing	50	10,000	100,000

Use the step down method and allocate the service department costs to the operating departments. Allocate costs of Admin first, then cafeteria, and then engineering.

Now let us take another example, in this example we will show how service departments costs are allocated particularly when there are reciprocating the service departments, reciprocate meaning that they also give service to themselves apart from giving service to production departments. Now Fancy Tools and Dies wishes to allocate it is 3 service department costs to the operating departments.

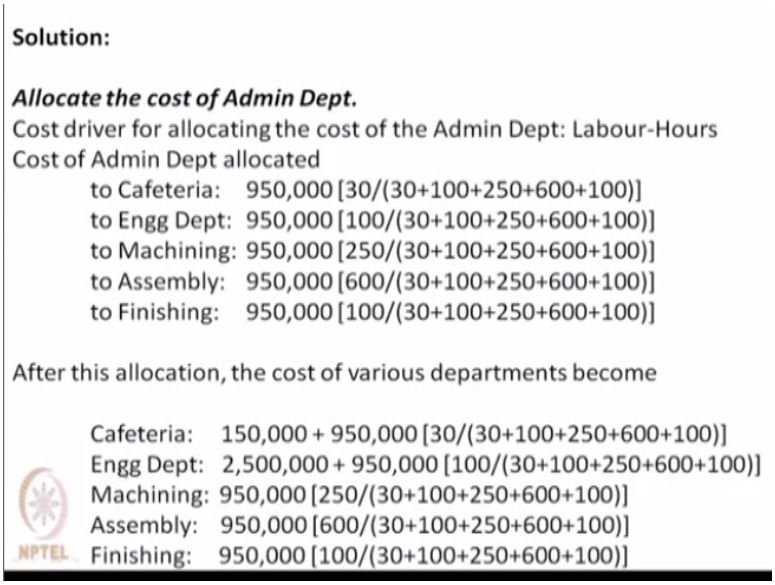
These service departments and their budgeted costs are cafeteria rupees 150,000, engineering department rupees 2,500,000 and administrative expenses rupees 950,000. Cafeteria employees worked 30,000 labour hours per hour per year. There are 50 engineering employees with 100,000 total labour hours and there are 3 operating departments, machining, assembly and finishing.

Number of employees employed are 1000, 450 and 50. Engineering hours worked 50,000, 20,000, 10,000. Total labour hours 250,000; 600,000; 100,000. So these values are required because as we will see we need them as cost drivers, when we allocate the service departments cost to these operating departments. Now if you recall there are 2 methods of allocating service departments cost.

One is the direct method, where we disregard any reciprocal services given to various service departments, the other is the step down method. In the step down method we consider the services given by one service department to another. Now here it is asking us to use this step down method, to allocate the service department costs to the operating departments and it is said allocate costs of administrative department first, this one first, then cafeteria.

And finally the engineering department. So starting with administrative department. Administrative department, then cafeteria and then engineering.

(Refer Slide Time: 44:32)



Now we will start allocating the cost of the administrative department. Now the cost driver for allocating the cost of the administrative department is labour hour, how many people and for how many hours they are working, so first of all there are 1, 2, 3, 4, 5. 2 service departments and 3 operating departments. So their total labour hours will be all this added 30 for cafeteria, 100 for engineering, 250 for machining, 600 for assembly, 100 for finishing.

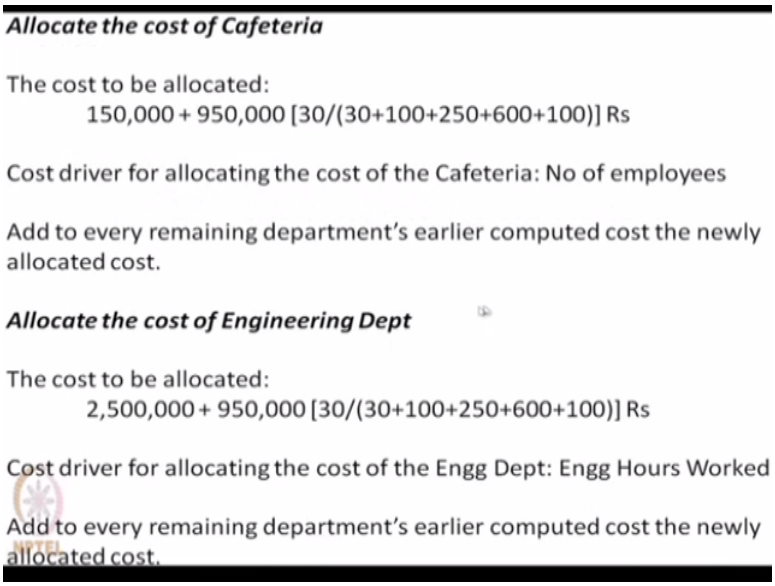
So this is the total labour hours and cafeteria consumes only 30 labour hours. So in that proportion the amount of administrative departments cost which is 950,000 will be allocated

to cafeteria, and in similar fashion only the change is here the numerator is instead of 30 it is 100 for engineering, 250 for machining, 600 for assembly and 100 for finishing. This ratio the costs are administered there.

The amount can be found out which I have not calculated, after this allocation the cost of various departments become it is own cost whatever it was existing plus this amount allocated from the administrative department. For cafeteria it was 150,000, for engineering it was 2,500,000; so 150,000 + the cost allocate all that will be added to cafeteria.

And then for engineering department it was 2,500,000 + this amount. For machining it is this, for assembly it is this and for finishing it is this. So this is the cost of various departments. Now that we know the cost of these departments, we will then go for allocating this cost which is for cafeteria to the remaining service department and to the other 3 operating departments.

(Refer Slide Time: 47:20)



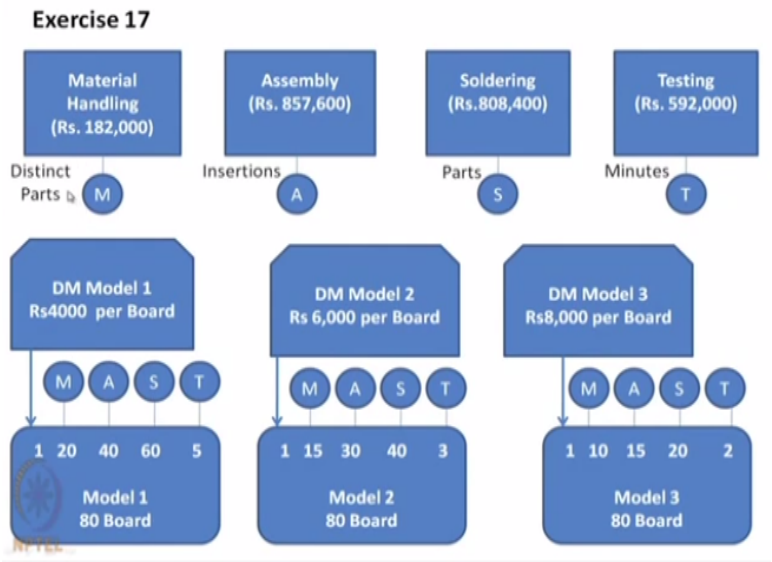
So allocate the cost of cafeteria, the cost to be allocated is this, this we got from here 150,000 + all these, so that is what we are writing here. For the cafeteria the total cost becomes it is own cost, direct cost + the cost allocated from the administrative department therefore the total cost as far as cafeteria is concerned after administrative costs are allocated is this and this is to be allocated to the other 4 remaining departments.

Now here the cost driver for allocating the cost of cafeteria is the number of employees who take their food in the cafeteria. So number of employees, the values are given here. Number

of employees in machining, assembly and finishing are given here and also are given how many workers or employees are working with engineering. So this is 50 here so 50 + 1000 + 450 + 50 so that is I think is 1500.

So this amount whole multiplied by 50/1,500 will be allocated to the engineering department and in the similar fashion they will be added to their original cost + the cost that was earlier allocated from administrative department to find out the cost for engineering department. Similarly allocate the cost of engineering department later and it is cost driver is engineering hours worked. So this is the way (()) (49:17) that is for exercise 16.

(Refer Slide Time: 49:30)



Now we come to an example of activity based costing, this is the last exercise that we shall take up today. If you recall this one was not completely done in our last lecture, for this problem was nevertheless discussed. These are the activities, material handling activity, assembly activity, soldering, testing. These are the 4 activities, and these are the variable costs, direct material for model 1, direct material for model 2, direct material for model 3.

And these are the cost objects model 1, 2 and 3. The cost drivers here are distinct parts, insertions, parts and minutes and these are the consumption rates. This is the variable cost and these are the consumption rates for the activities and this is the unit variable costs. This we did not solve, but we have discussed this problem earlier.

(Refer Slide Time: 51:03)

Solution:

Cost of a model
= DM + Sum of activity costs allocated to the model

Model 1
4,000 + (182,000)[20/(20+15+10)] + (857,600)[40/(40+30+15)]
+ (808,400) [60/(60+40+20)] + (592,000)[5/(5+3+2)] Rs

Model 2
6,000 + (182,000)(15/(20+15+10) + (857,600)[30/(40+30+15)]
+ (808,400) [40/(60+40+20)] + (592,000)[3/(5+3+2)] Rs

Model 3
8,000 + (182,000)(10/(20+15+10) + (857,600)[15/(40+30+15)]
+ (808,400) [20/(60+40+20)] + (592,000)[2/(5+3+2)] Rs

Now we are giving the solution, cost of a model is direct material + sum of activity costs allocated to the model. Now for model 1, this is 4,000 + 20 * 182,000 * 20/20+15+10, how is it coming, 20, 15 and 10, so at this ratio this amount will be allocated to the model 1, so 20/this * this will be added to model 1 as far as the material handling cost is concerned, as far as assembly is concerned in the similar fashion it is 40 + 30+ 15 will be in the denominator.

And in the numerator it will be 40 and that will be * 857,600 that is what we have done here. And similarly 808,400 * 60/60 + 40 + 20 and in the similar fashion it is 592,000 * 5 / 5 + 3 + 2 so this is how model 1 is calculated and in the similar fashion model 2 will be calculated and model 3 will be calculated.

So in this today we tried to take up some exercises for different topics that we have covered in course of our lecture. In the forthcoming lectures we shall be talking a little bit on job costing and process costing, how to cost inventory and then we shall pass on to accounting and financial statements. Thank you.