

8

Operating Costing

Basic Concepts

Operating Costing	It is a method of ascertaining costs of providing or operating a service. This method of costing is applied by those undertakings which provide services rather than production of commodities.
Cost Units	Transport service – Passenger km., quintal km., or tone-km. Supply service – Kw hr., Cubic metre, per kg., per litre. Hospital – Patient per day, room per day or per bed, per operation etc. Canteen – Per item, per meal etc. Cinema – Per ticket. Composite units i.e. tonnes km., quintal km. etc. may be computed in two ways.
Composite Units	Two different units are composed into a single unit. Examples are Passenger-km., Kilowatt-hour, Tonne-km. etc.
Absolute Tonne-km.	This is a weighted average of distance travelled and weight carried.
Commercial Tonne-km.	This is a simple average of weight carried multiplied by total distance travelled.
Round-trip	Travelling to a destination and return back to the starting point.

SECTION-A

Question-1

Explain briefly, what do you understand by Operating Costing. How are composite units computed?

Solution:

Operating Costing: It is method of ascertaining costs of providing or operating a service. This method of costing is applied by those undertakings which provide services rather than production of commodities. This method of costing is used by transport companies, gas and water works departments, electricity supply companies, canteens, hospitals, theatres, schools etc.

Composite units may be computed in two ways:

- (a) Absolute (weighted average) tones- km., quintal- km. etc.
- (b) Commercial (simple average) tonnes- km., quintal-km. etc.

Absolute tonnes-km. are the sum total of tonnes-km. arrived at by multiplying various distances by respective load quantities carried.

Commercial tonnes-km., are arrived at by multiplying total distance km., by average load quantity.

Question-2

What do you understand by Operating Costs? Describe its essential features and state where it can be usefully implemented?

Solution:

Operating Costs are the costs incurred by undertakings which do not manufacture any product but provide a service. Such undertakings for example are — Transport concerns, Gas agencies; Electricity Undertakings; Hospitals; Theatres etc. Because of the varied nature of activities carried out by the service undertakings, the cost system used is obviously different from that followed in manufacturing concerns.

The essential features of operating costs are as follows:

- (1) The operating costs can be classified under three categories. For example in the case of transport undertaking these three categories are as follows:
 - (a) Operating and running charges: It includes expenses of variable nature. For example expenses on petrol, diesel, lubricating oil, and grease etc.
 - (b) Maintenance charges: These expenses are of semi-variable nature and includes the cost of tyres and tubes, repairs and maintenance, spares and accessories, overhaul, etc.
 - (c) Fixed or standing charges: These includes garage rent, insurance, road licence, depreciation, interest on capital, salary of operating manager, etc.
- (2) The cost unit used is composite like passenger-mile; Kilowatt-hour, etc.

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It can be implemented in all firms of transport, airlines, bus-service, etc., and by all firms of distribution undertakings.

Question-3

Distinguish between Operating Costing and Operation Costing.

Solution:

Operating Costing: It is a method of costing applied by undertakings which provide service rather than production of commodities. Like unit costing and process costing, operating costing is thus a form of operation costing.

The emphasis under operating costing is on the ascertainment of cost of rendering services rather than on the cost of manufacturing a product. It is applied by transport companies, gas and water works, electricity supply companies, canteens, hospitals, theatres, school etc. Within an organisation itself certain departments too are known as service departments which provide ancillary services to the production departments. For example maintenance department; power house, boiler house, canteen, hospital, internal transport etc.

Operation Costing: It represents a refinement of process costing. In this each operation instead of each process or stage of production is separately costed. This may offer better scope for control. At the end of each operation, the unit operation cost may be computed by dividing the total operation cost by total output.

SECTION – B

Calculation of Absolute Tonne-Km and Commercial Tonne-Km.

Question 1

Calculate total passenger kilometres from the following information:

Number of buses 6, number of days operating in a month 25, trips made by each bus per day 8, distance covered 20 kilometres (one side), capacity of bus 40 passengers, normally 80% of capacity utilization.

Solution:

Calculation of passenger kilometer:

$$= 6 \text{ buses} \times 25 \text{ days} \times 8 \text{ trips} \times 2 \text{ sides} \times 20 \text{ k.m.} \times 40 \text{ passengers} \times 80\%$$

$$= 15,36,000 \text{ passenger km.}$$

Question 2

A lorry starts with a load of 24 tonnes of goods from station A. It unloads 10 tonnes at station B and rest of goods at station C. It reaches back directly to station A after getting reloaded with 18 tonnes of goods at station C. The distance between A to B, B to C and then from C to A are 270 kms, 150 kms and 325 kms respectively. Compute 'Absolute tonnes km.' and 'Commercial tones-km'.

Solution:**Absolute tonnes km.:**

$$\begin{aligned}
 &= \text{Weight in tonnes} \times \text{Distance in km.} \\
 &= \text{From A to B} + \text{from B to C} + \text{from C to A} \\
 &= (24 \text{ tonnes} \times 270 \text{ km.}) + (14 \text{ tons} \times 150 \text{ km.}) + (18 \text{ tonnes} \times 325 \text{ km.}) \\
 &= 6,480 \text{ tonnes-km.} + 2,100 \text{ tonnes-km.} + 5,850 \text{ tonnes-km.} \\
 &= 14,430 \text{ tonnes-km.}
 \end{aligned}$$

Commercial Tonnes km.

= Average weight load \times Total distance (km.) travelled

$$\begin{aligned}
 &= \left(\frac{24+14+18}{3} \right) \text{ Tonnes} \times 745 \text{ km.} \\
 &= 13,906.67 \text{ Tonnes km}
 \end{aligned}$$

Costing for Transport Agencies**Question 3**

A Mineral is transported from two mines – 'A' and 'B' and unloaded at plots in a Railway Station. Mine A is at a distance of 10 km., and B is at a distance of 15 km. from railhead plots. A fleet of lorries of 5 tonne carrying capacity is used for the transport of mineral from the mines. Records reveal that the lorries average a speed of 30 km. per hour, when running and regularly take 10 minutes to unload at the railhead. At mine 'A' loading time averages 30 minutes per load while at mine 'B' loading time averages 20 minutes per load.

Drivers' wages, depreciation, insurance and taxes are found to cost ₹ 9 per hour operated. Fuel, oil, tyres, repairs and maintenance cost ₹ 1.20 per km.

Draw up a statement, showing the cost per tonne-kilometer of carrying mineral from each mine.

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Solution:

Statement showing the cost per tonne-kilometre of carrying mineral from each mine

	Mine A (₹)	Mine B (₹)
Fixed cost per trip: (Refer to working note 1)		
(Driver's wages, depreciation, insurance and taxes)		
A: 1 hour 20 minutes @ ₹ 9 per hour	12.00	
B: 1 hour 30 minutes @ ₹ 9 per hour		13.50
Running and maintenance cost:		
(Fuel, oil, tyres, repairs and maintenance)		
A: 20 km. ₹ 1.20 per km.	24.00	
B: 30 km. ₹ 1.20 per km.		36.00
Total cost per trip	36.00	49.50
Cost per tonne – km	0.72	0.66
(Refer to working note 2)	$\left(\frac{₹36}{50 \text{ tonne – km}} \right)$	$\left(\frac{₹49.50}{75 \text{ tonne – km}} \right)$

Working notes

	Mine- A	Mine- B
(1) Total operated time taken per trip		
Running time to & fro	40 minutes	60 minutes
	$\left(20 \text{ km.} \times \frac{60 \text{ minutes}}{30 \text{ km.}} \right)$	$\left(30 \text{ km.} \times \frac{60 \text{ minutes}}{30 \text{ km.}} \right)$
Un-loading time	10 minutes	10 minutes
Loading time	30 minutes	20 minutes
Total operated time	80 minutes or 1 hour 20 minutes	90 minutes or 1 hour 30 minutes
(2). Effective tones – km.	50 (5 tonnes × 10 km.)	75 (5 tonnes × 15 km.)

Question 4

EPS is a Public School having 25 buses each plying in different directions for the transport of its school students. In view of large number of students availing of the bus service, the buses work two shifts daily both in the morning and in the afternoon. The buses are garaged in the

school. The workload of the students has been so arranged that in the morning, the first trip picks up senior students and the second trip plying an hour later picks up junior students. Similarly, in the afternoon, the first trip takes the junior students and an hour later the second trip takes the senior students home.

The distance travelled by each bus, one way is 16 km. The school works 24 days in a month and remains closed for vacation in May and June. The bus fee, however, is payable by the students for all the 12 months in a year.

The details of expenses for the year 2013-2014 are as under:

Driver's salary – payable for all the 12 in months.	₹ 5,000 per month per driver.
Cleaner's salary payable for all the 12 months (one cleaner has been employed for every five buses).	₹ 3,000 per month per cleaner
Licence Fees, Taxes etc.	₹ 2,300 per bus per annum
Insurance Premium	₹ 15,600 per bus per annum
Repairs and Maintenance	₹ 16,400 per bus per annum
Purchase price of the bus	₹ 16,50,000 each
Life of the bus	16 years
Scrap value	₹ 1,50,000
Diesel Cost	₹ 18.50 per litre

Each bus gives an average of 10 km. per litre of diesel. The seating capacity of each bus is 60 students. The seating capacity is fully occupied during the whole year.

The school follows differential bus fees based on distance traveled as under:

Students picked up and dropped within the range of distance from the school	Bus fee	Percentage of students availing this facility
4 km.	25% of Full	15%
8 km.	50% of Full	30%
16 km.	Full	55%

Ignore interest. Since the bus fees has to be based on average cost, you are required to

- (i) Prepare a statement showing the expenses of operating a single bus and the fleet of 25 buses for a year.
- (ii) Work out average cost per student per month in respect of:
 - (a) Students coming from a distance of upto 4 km. from the school.
 - (b) Students coming from a distance of upto 8 km. from the school; and

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(c) Students coming from a distance of upto 16 km. from the school.

Solution:

- (i) **EPS Public School**
Statement showing the expenses of operating a single bus and the fleet of 25 buses for a year

Particulars	Per bus per annum (₹)	Fleet of 25 buses per annum (₹)
<i>Running costs : (A)</i>		
Diesel (Refer to working note 1)	56,832	14,20,800
<i>Repairs & maintenance costs: (B)</i>	16,400	4,10,000
<i>Fixed charges:</i>		
Driver's salary (₹ 5,000 × 12 months)	60,000	15,00,000
Cleaners salary (₹3,000 × 1/5 th × 12 months)	7,200	1,80,000
Licence fee, taxes etc.	2,300	57,500
Insurance	15,600	3,90,000
Depreciation	93,750	23,43,750
Total fixed charges: (C)	1,78,850	44,71,250
Total expenses: (A+B+C)	2,52,082	63,02,050

- (ii) Average cost per student per month in respect of students coming from a distance of:

(a) 4 km. from the school {₹ 2,52,082 / (354 students × 12 months)} (Refer to Working Note 2)	₹ 59.34
(b) 8 km. from the school (₹ 59.34 × 2)	₹ 118.68
(c) 16 km. from the school (₹ 59.34 × 4)	₹ 237.36

Working Notes:

1. Calculation of diesel cost per bus:

No. of trips made by a bus each day	4
Distance travelled in one trip both ways (16 km. × 2 trips)	32 km.
Distance traveled per day by a bus (32 km. × 4 shifts)	128 km.
Distance traveled during a month (128 km. × 24 days)	3,072 km.

Distance traveled per year (3,072 km. × 10 months)	30,720 km.
No. of litres of diesel required per bus per year (30,720 km. ÷ 10 km.)	3,072 litres
Cost of diesel per bus per year (3,072 litres × ₹ 18.50)	₹ 56,832

2. Calculation of number of students per bus:

Bus capacity of 2 trips (60 students × 2 trips)	120 students
1/4 th fare students (15% × 120 students)	18 students
1/2 fare 30% students (equivalent to 1/4 th fare students)	72 students
Full fare 55% students (equivalent to 1/4 th fare students)	264 students
Total 1/4 th fare students	354 students

Question 5

A transport company has a fleet of three trucks of 10 tonnes capacity each plying in different directions for transport of customer's goods. The trucks run loaded with goods and return empty. The distance travelled, number of trips made and the load carried per day by each truck are as under:

Truck No.	One way Distance Km	No. of trips per day	Load carried per trip / day tonnes
1	16	4	6
2	40	2	9
3	30	3	8

The analysis of maintenance cost and the total distance travelled during the last two years is as under

Year	Total distance travelled	Maintenance Cost ₹
1	1,60,200	46,050
2	1,56,700	45,175

The following are the details of expenses for the year under review:

Diesel	₹ 10 per litre. Each litre gives 4 km per litre of diesel on an average.
Driver's salary	₹ 2,000 per month
Licence and taxes	₹ 5,000 per annum per truck
Insurance	₹ 5,000 per annum for all the three vehicles

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Purchase Price per truck	₹ 3,00,000, Life 10 years. Scrap value at the end of life is ₹ 10,000.
Oil and sundries	₹ 25 per 100 km run.
General Overhead	₹ 11,084 per annum

The vehicles operate 24 days per month on an average.

Required

- Prepare an Annual Cost Statement covering the fleet of three vehicles.
- Calculate the cost per km. run.
- Determine the freight rate per tonne km. to yield a profit of 10% on freight.

Solution:

(i) Annual Cost Statement of three vehicles

	(₹)
Diesel {(1,34,784 km. ÷ 4 km) × ₹ 10} (Refer to Working Note 1)	3,36,960
Oil & sundries {(1,34,784 km. ÷ 100 km.) × ₹ 25}	33,696
Maintenance {(1,34,784 km. × ₹ 0.25) + ₹ 6,000} (Refer to Working Note 2)	39,696
Drivers' salary {(₹ 2,000 × 12 months) × 3 trucks}	72,000
Licence and taxes (₹ 5,000 × 3 trucks)	15,000
Insurance	5,000
Depreciation {(₹ 2,90,000 ÷ 10 years) × 3 trucks}	87,000
General overhead	11,084
Total annual cost	6,00,436

(ii) Cost per km. run

$$\begin{aligned} \text{Cost per kilometer run} &= \frac{\text{Total annual cost of vehicles}}{\text{Total kilometre travelled annually}} \quad (\text{Refer to Working Note 1}) \\ &= \frac{\text{₹ 6,00,436}}{1,34,784 \text{ Kms}} = \text{₹ 4.4548} \end{aligned}$$

(iii) Freight rate per tonne km (to yield a profit of 10% on freight)

$$\text{Cost per tonne km.} = \frac{\text{Total annual cost of three vehicles}}{\text{Total effective tonnes kms. per annum}} \quad (\text{Refer to Working Note 1})$$

$$= \frac{\text{₹ } 6,00,436}{5,25,312 \text{ kms}} = \text{₹ } 1.143$$

Freight rate per tonne km. $\left(\frac{\text{₹ } 1.143}{0.9} \right) \times 1 = \text{₹ } 1.27$

Working Notes:

- Total kilometre travelled and tonnes kilometre (load carried) by three trucks in one year

Truck number	One way distance in kms	No. of trips	Total distance covered in km per day	Load carried per trip / day in tonnes	Total effective tonnes km
1	16	4	128	6	384
2	40	2	160	9	720
3	30	3	180	8	720
Total			468		1,824

Total kilometre travelled by three trucks in one year

$$(468 \text{ km.} \times 24 \text{ days} \times 12 \text{ months}) = 1,34,784$$

Total effective tonnes kilometre of load carried by three trucks during one year

$$(1,824 \text{ tonnes km.} \times 24 \text{ days} \times 12 \text{ months}) = 5,25,312$$

- Fixed and variable component of maintenance cost:

$$\begin{aligned} \text{Variable maintenance cost per km} &= \frac{\text{Difference in maintenance cost}}{\text{Difference in distance travelled}} \\ &= \frac{\text{₹ } 46,050 - \text{₹ } 45,175}{1,60,200 \text{ kms} - 1,56,700 \text{ kms}} \\ &= \text{₹ } 0.25 \end{aligned}$$

$$\begin{aligned} \text{Fixed maintenance cost} &= \text{Total maintenance cost} - \text{Variable maintenance cost} \\ &= \text{₹ } 46,050 - 1,60,200 \text{ kms} \times \text{₹ } 0.25 = \text{₹ } 6,000 \end{aligned}$$

Question 6

A transport company has 20 vehicles, which capacities are as follows:

No. of Vehicles	Capacity per vehicle
5	9 tonne
6	12 tonne

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7	15 tonne
2	20 tonne

The company provides the goods transport service between stations 'A' to station 'B'. Distance between these stations is 200 kilometres. Each vehicle makes one round trip per day on average. Vehicles are loaded with an average of 90 per cent of capacity at the time of departure from station 'A' to station 'B' and at the time of return back loaded with 70 per cent of capacity. 10 per cent of vehicles are laid up for repairs every day. The following information are related to the month of October, 2013:

Salary of Transport Manager	₹ 30,000
Salary of 30 drivers	₹ 4,000 each driver
Wages of 25 Helpers	₹ 2,000 each helper
Wages of 20 Labourers	₹ 1,500 each labourer
Consumable stores	₹ 45,000
Insurance (Annual)	₹ 24,000
Road Licence (Annual)	₹ 60,000
Cost of Diesel per litre	₹ 35
Kilometres run per litre each vehicle	5 Km.
Lubricant, Oil etc.	₹ 23,500
Cost of replacement of Tyres, Tubes, other parts etc.	₹ 1,25,000
Garage rent (Annual)	₹ 90,000
Transport Technical Service Charges	₹ 10,000
Electricity and Gas charges	₹ 5,000
Depreciation of vehicles	₹ 2,00,000

There is a workshop attached to transport department which repairs these vehicles and other vehicles also. 40 per cent of transport manager's salary is debited to the workshop. The transport department is charged ₹ 28,000 for the service rendered by the workshop during October, 2013. During the month of October, 2013 operation was 25 days.

You are required:

- (i) Calculate per ton-km operating cost.
- (ii) Find out the freight to be charged per ton-km, if the company earned a profit of 25 per cent on freight.

Solution:

(i) Operating Cost Sheet for the month of October, 2013

Particulars		Amount (₹)
A.	Fixed Charges:	
	Manager's salary (₹ 30,000 × 60%)	18,000
	Drivers' Salary (₹ 4,000 × 30 drivers)	1,20,000
	Helpers' wages (₹ 2,000 × 25 helpers)	50,000
	Labourer wages (₹ 1,500 × 20 labourers)	30,000
	Insurance (₹ 24,000 ÷ 12 months)	2,000
	Road licence (₹ 60,000 ÷ 12 months)	5,000
	Garage rent (₹ 90,000 ÷ 12 months)	7,500
	Transport Technical Service Charges	10,000
	Share in workshop expenses	28,000
	Total (A)	2,70,500
B.	Variable Charges:	
	Cost of diesel (Working Note 1)	12,60,000
	Lubricant, Oil etc.	23,500
	Depreciation	2,00,000
	Replacement of Tyres, Tubes & other parts	1,25,000
	Consumable Stores	45,000
	Electricity and Gas charges	5,000
	Total (B)	16,58,500
C.	Total Cost (A + B)	19,29,000
D.	Total Ton-Kms. (Working Note 2)	18,86,400
E.	Cost per ton-km. (C ÷ D)	1.022

(ii) Calculation of Chargeable Freight

Cost per ton-km.	₹ 1.022
Add: Profit @ 25% on freight or 33 $\frac{1}{3}$ % on cost	₹ 0.341
Chargeable freight per ton-km.	₹ 1.363 or ₹ 1.36

Working Notes:

1. Cost of Diesel:

Distance covered by each vehicle during October, 2013

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$$= 200 \text{ k.m.} \times 2 \times 25 \text{ days} \times 90 \% = 9,000 \text{ km.}$$

$$\text{Consumption of diesel} = \frac{9,000 \text{ k.m.} \times 20 \text{ vehicles}}{5 \text{ k.m.}} = 36,000 \text{ litres.}$$

$$\text{Cost of diesel} = 36,000 \text{ litres} \times ₹ 35 = ₹ 12,60,000.$$

2. Calculation of total ton-km:

Total Ton-Km. = Total Capacity × Distance covered by each vehicle × Average Capacity Utilisation ratio.

$$= [(5 \times 9 \text{ ton}) + (6 \times 12 \text{ ton}) + (7 \times 15 \text{ ton}) + (2 \times 20 \text{ ton})] \times 9,000 \text{ k.m.} \times \frac{(90\% + 70\%)}{2}$$

$$= (45 + 72 + 105 + 40) \times 9,000 \text{ k.m.} \times 80\%$$

$$= 262 \times 9,000 \times 80\%.$$

$$= 18,86,400 \text{ ton-km.}$$

Question 7

A transport company has been given a 40 kilometre long route to run 5 buses. The cost of each bus is ₹ 6,50,000. The buses will make 3 round trips per day carrying on an average 80 percent passengers of their seating capacity. The seating capacity of each bus is 40 passengers. The buses will run on an average 25 days in a month. The other information for the year 2013-14 are given below:

Garage rent	₹ 4,000 per month
Annual repairs and maintenance	₹ 22,500 each bus
Salaries of 5 drivers	₹ 3,000 each per month
Wages of 5 conductors	₹ 1,200 each per month
Manager's salary	₹ 7,500 per month
Road tax, permit fee, etc.	₹ 5,000 for a quarter
Office expenses	₹ 2,000 per month
Cost of diesel per litre	₹ 33
Kilometre run per litre for each bus	6 kilometres
Annual depreciation	15% of cost
Annual Insurance	3% of cost

You are required to calculate the bus fare to be charged from each passenger per kilometre, if the company wants to earn profits of $33\frac{1}{3}$ percent on taking (total receipts from passengers).

Solution:

Operating Cost Sheet for the year 2013- 14

	Particulars	Total Cost (₹)
A.	Fixed Charges:	
	Garage rent (₹4,000 × 12 months)	48,000
	Salary of drivers (₹3,000 × 5 drivers × 12 months)	1,80,000
	Wages of Conductors (₹1,200 × 5 conductors × 12 months)	72,000
	Manager's salary (₹ 7,500 × 12 months)	90,000
	Road Tax, Permit fee, etc. (₹ 5,000 × 4 quarters)	20,000
	Office expenses (₹ 2,000 × 12 months)	24,000
	Insurance (₹ 6,50,000 × 5 buses × 3%)	97,500
	Total (A)	5,31,500
B.	Variable Charges:	
	Repairs and Maintenance (₹ 22,500 × 5 buses)	1,12,500
	Depreciation (₹ 6,50,000 × 5 buses × 15%)	4,87,500
	Diesel {(3,60,000 km. ÷ 6 km.) × ₹33}	19,80,000
	Total (B)	25,80,000
	Total Cost (A+B)	31,11,500
	Add: 33 1/3 % Profit on takings or 50% on cost	15,55,750
	Total Takings (Total bus fare collection)	46,67,250
	Total Passenger-km. (Working Note 2)	1,15,20,000
	Bus fare to be charged from each passenger per km.	0.405

Working Notes:

1. Total Kilometres to be run during the year 2013-14
 = 40 km. × 2 sides × 3 trips × 25 days × 12 months × 5 buses = 3, 60,000 Kilometres
2. Total passenger Kilometres
 = 3,60,000 km. × 40 passengers × 80% = 1,15,20,000 Passenger- km.

Question 8

The following information relates to a bus operator:

Cost of the bus	₹	18,00,000
Insurance charges		3% p.a.

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<i>Manager-cum accountant's salary</i>	₹	8,000 p.m.
<i>Annual Tax</i>	₹	50,000
<i>Garage Rent</i>	₹	2,500 p.m.
<i>Annual repair & maintenance</i>	₹	1,50,000
<i>Expected life of the bus</i>		15 years
<i>Scrap value at the end of 15 years</i>	₹	1,20,000
<i>Driver's salary</i>	₹	15,000 p.m.
<i>Conductor's salary</i>	₹	12,000 p.m.
<i>Stationery</i>	₹	500 p.m.
<i>Engine oil, lubricants (for 1200 km.)</i>	₹	2,500
<i>Diesel and oil (for 10 km.)</i>	₹	52
<i>Commission to driver and conductor (shared equally)</i>		10% of collections
<i>Route distance</i>		20 km long

The bus will make 3 round trips for carrying on the average 40 passengers in each trip. Assume 15% profit on collections. The bus will work on the average 25 days in a month.

Calculate fare for passenger-km

Solution:

Working Notes:

- (i) Calculation of Depreciation of Bus (Per month)

$$\begin{aligned} &= \frac{\text{Cost of the bus} - \text{Scrap value at the end of the 15 years}}{\text{Expected life of the bus}} \\ &= \frac{\text{₹18,00,000} - \text{₹1,20,000}}{15 \text{ years}} \\ &= \text{₹ 1,12,000 p.a.} \end{aligned}$$

$$\text{Depreciation per month} = \frac{\text{₹1,12,000}}{12 \text{ months}} = \text{₹ 9,333.33}$$

- (ii) Calculation of total distance travelled and Passenger-km. per month

$$\text{Total distance} = 3 \text{ trips} \times 2 \times 20 \text{ k.m.} \times 25 \text{ days} = 3,000 \text{ k.m.}$$

$$\begin{aligned} \text{Total Passenger-km.} &= 3 \text{ trips} \times 2 \times 20 \text{ k.m.} \times 25 \text{ days} \times 40 \text{ passengers} \\ &= 1,20,000 \text{ Passenger-k.m.} \end{aligned}$$

(iii) Cost of Engine oil, Lubricants and Diesel & oil (Per month)

$$\text{Engine oil \& lubricants} = \frac{\text{Total distance travelled}}{1,200 \text{ K.m.}} \times ₹ 2,500$$

$$= \frac{3,000 \text{ K.m.}}{1,200 \text{ K.m.}} \times ₹ 2,500 = ₹ 6,250$$

$$\text{Diesel and Oil} = \frac{\text{Total distance travelled}}{10 \text{ K.m.}} \times ₹ 52$$

$$= \frac{3,000 \text{ K.m.}}{10 \text{ K.m.}} \times ₹ 52 = ₹ 15,600$$

Statement showing the Operating Cost per Passenger-km.

	(₹)	(₹)
<i>(i) Standing Charges:</i>		
Depreciation {Working Note- (i)}	9,333.33	
Insurance Charge $\left(\frac{₹18,00,000}{12} \times 3\%\right)$	4,500	
Manager-cum-accountant's salary	8,000	
Annual Tax (p.m.) $\left(\frac{₹50,000}{12}\right)$	4,166.67	
Garage Rent	2,500	28,500
<i>(ii) Maintenance Charges:</i>		
Repair & Maintenance per month $\left(\frac{₹1,50,000}{12}\right)$		12,500
<i>(iii) Running Cost:</i>		
Driver's Salary	15,000	
Conductor's Salary	12,000	
Stationery	500	
Engine oil & Lubricants {Working Note- (iii)}	6,250	
Diesel and oil {Working Note- (iii)}	15,600	
Total running cost before deducting commission to driver and conductor	49,350	49,350
<i>Total cost excluding commission to driver and conductor</i>		90,350

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Driver's commission on collection*		6,023.34
Conductor's commission on collection*		6,023.33
Total Cost (i) +(ii) + (iii)		1,02,396.67
Add: Profit**		18,070
Total Collection		1,20,466.67

Working Note:

Total costs before commission on collection and net profit is ₹ 90,350.

Commission on collection to driver and conductor is 10% of collection and Profit is 15% of collection means

$$100\% - (10\% + 15\%) \text{ i.e. } 75\% = ₹ 90,350$$

$$\text{So, Total collection} = \frac{₹ 90,350}{75} \times 100 = ₹ 1,20,466.67$$

$$*\text{Total Commission on collection} = 10\% \times ₹ 1,20,466.67 = ₹ 12,046.67$$

$$\text{Driver's share} = 50\% \times ₹ 12,046.67 = 6,023.34$$

$$\text{Conductor's share} = 50\% \times ₹ 12,046.67 = 6,023.33$$

$$** \text{ Profit on collection} = ₹ 1,20,466.67 \times 15\% = ₹ 18,070$$

$$\begin{aligned} \text{Fare per Passenger-km.} &= \frac{\text{Total Collection}}{\text{Total Passenger - km. \{Working Note (ii)\}}} \\ &= \frac{₹ 1,20,466.67}{1,20,000} \\ &= ₹ 1.004 \text{ (appx.)} \end{aligned}$$

Question 9

Voyager Cabs Pvt. Ltd. is a New Delhi based cab renting company, provides cab facility on rent for cities Delhi, Agra and Jaipur to the tourists. To attract more tourists it has launched a new three days tour package for Delhi-Jaipur-Agra-Delhi. Following are the relevant information regarding the package:

<i>Distance between Delhi to Jaipur (Km.)</i>	<i>274</i>
<i>Distance between Delhi to Agra (Km.)</i>	<i>242</i>
<i>Distance between Agra to Jaipur (Km.)</i>	<i>238</i>
<i>Price of diesel in Delhi</i>	<i>₹ 54 per litre</i>
<i>Price of diesel in Jaipur</i>	<i>₹ 56 per litre</i>

Price of diesel in Agra	₹ 58 per litre
Mileage of cab per litre of diesel (Km.)	16
Chauffeur's salary	₹ 12,000 per month
Cost of the cab	₹ 12,00,000
Expected life of the cab	24,00,000 kms.
Servicing cost	₹ 30,000 after every 50,000 kilometres run.
Chauffeur's meal allowance	₹ 50 for every 200 kilometres of completed journey
Other set up and office cost	₹ 2,400 per month.

Voyager Cabs has made tie-up with fuel service centres at Agra, Jaipur and Delhi to fill diesel to its cabs on production of fuel passbook to the fuel centre. Company has a policy to get fuel filled up sufficient to reach next destination only.

You are required to calculate the price inclusive of service tax @ 12.36% to be quoted for the package if company wants to earn profit of 25% on its net takings i.e. excluding service tax.

Solution:

Calculation of Price of the Delhi-Jaipur-Agra-Delhi tour package

Particulars	Amount (₹)	Amount (₹)
Diesel Cost (Working Note-2)		2,635.00
Servicing Cost $\left(\frac{₹ 30,000}{50,000\text{kms}} \times 754\text{kms.} \right)$		452.40
Chauffeur's meal cost (three 200 km. completed journey × ₹ 50)		150.00
<u>Other Allocable costs:</u>		
Depreciation $\left(\frac{₹12,00,000}{24,00,000\text{kms}} \times 754\text{kms.} \right)$	377.00	
Other set-up and office cost $\left(\frac{₹2,400}{30\text{days}} \times 3\text{days} \right)$	240.00	
Chauffeur's salary $\left(\frac{₹12,000}{30\text{days}} \times 3\text{days} \right)$	<u>1,200.00</u>	<u>1,817.00</u>
Total Cost		<u>5,054.40</u>
Add: Profit (25% of net takings or 1/3 rd of total cost)		<u>1,684.80</u>
		6,739.20
Add: Service Tax @12.36%		<u>832.97</u>
Price of the package (inclusive of service tax)		<u>7,572.17</u>

8.19 Cost Accounting

Working Notes

(1) Total distance of journey

From	To	Distance (in Km.)
Delhi	Jaipur	274
Jaipur	Agra	238
Agra	Delhi	<u>242</u>
Total Distance		754

(2) Cost of Diesel

From	To	Distance (in Km.)	Price of diesel per litre (₹)	Total diesel Cost (₹)
I	II	III	IV	V= (III ÷ 16 km) × IV
Delhi	Jaipur	274	54	924.75
Jaipur	Agra	238	56	833.00
Agra	Delhi	242	58	<u>877.25</u>
Total cost				2,635.00

Question 10

Gopal Milk Co-Operative Society (GMCS) collects raw milk from the farmers of Ramgarh, Pratapgarh and Devgarh panchayats and processes these milk to make various dairy products. GMCS has its own vehicles (tankers) to collect and bring the milk to the processing plant. Vehicles are parked in the GMCS's garage situated within the plant compound. Following are the some information related with the vehicles:

	Ramgarh	Pratapgarh	Devgarh
No. of vehicles assigned	4	3	5
No. of trips a day	3	2	2
One way distance from the processing plant	24 k.m.	34 k.m.	16 k.m.
Toll tax paid p.m. (₹)	2,850	3,020	---

All the 5 vehicles assigned to Devgarh panchayat, were purchased five years back at a cost of ₹ 9,25,000 each. The 4 vehicles assigned to Ramgarh panchayat, were purchased two years back at a cost of ₹ 11,02,000 each and the remaining vehicles assigned to Pratapgarh were purchased last year at a cost of ₹ 13,12,000 each. With the purchase of each vehicle a two years free servicing warranty is provided. A vehicle gives 10 kmpl mileage in the first two year of purchase, 8 kmpl in next two years and 6 kmpl afterwards. The vehicles are subject to depreciation of 10% p.a. on straight line basis irrespective of usage. A vehicle has the

capacity to carry 25,000 litres of milk but on an average only 70% of the total capacity is utilized.

The following expenditure is related with the vehicles:

Salary of Driver (a driver for each vehicle)	₹ 18,000 p.m.
Salary to Cleaner (a cleaner for each vehicle)	₹ 11,000 p.m.
Allocated garage parking fee	₹ 1,350 per vehicle per month
Servicing cost	₹ 3,000 for every complete 5,000 k.m. run.
Price of diesel per litre	₹ 58.00

From the above information you are required to calculate

- (i) Total operating cost per month for each vehicle. (Take 30 days for the month)
- (ii) Vehicle operating cost per litre of milk.

Solution:

(i) Calculation of Operating Cost per month for each vehicle

	Ramgarh	Pratapgarh	Devgarh	Total
A. Running Costs:				
- Cost of diesel (Working Note- 2)	1,25,280	70,992	92,800	2,89,072
- Servicing cost (Working Note- 3)	9,000	---	3,000	12,000
	1,34,280	70,992	95,800	3,01,072
B. Fixed Costs:				
- Salary to drivers	72,000 (4 drivers × ₹ 18,000)	54,000 (3 drivers × ₹ 18,000)	90,000 (5 drivers × ₹ 18,000)	2,16,000
- Salary to cleaners	44,000 (4 cleaners × ₹ 11,000)	33,000 (3 cleaners × ₹ 11,000)	55,000 (5 cleaners × ₹ 11,000)	1,32,000
- Allocated garage parking fee	5,400 (4 vehicles × ₹ 1,350)	4,050 (3 vehicles × ₹ 1,350)	6,750 (5 vehicles × ₹ 1,350)	16,200
- Depreciation (Working Note- 4)	36,733	32,800	38,542	1,08,075
- Toll tax passes	2,850	3,020	---	5,870

8.21 Cost Accounting

	1,60,983	1,26,870	1,90,292	4,78,145
Total [A + B]	2,95,263	1,97,862	2,86,092	7,79,217
Operating Cost per vehicle	73,815.75 (₹ 2,95,263 ÷ 4 vehicles)	65,954 (₹ 1,97,862 ÷ 3 vehicles)	57,218.40 (₹ 2,86,092 ÷ 5 vehicles)	64,934.75 (₹ 7,79,217 ÷ 12 vehicles)

(ii) Vehicle operating cost per litre of milk

$$\frac{\text{Total Operating Cost per month}}{\text{Total milk carried a month}} = \frac{₹7,79,217}{1,47,00,000 \text{ Litres (Working Note - 5)}} = ₹ 0.053$$

Working Notes:

1. Distance covered by the vehicles in a month

Route	Total Distance (in K.M.)
Ramgarh (4 vehicles × 3 trips × 2 × 24 km. × 30 days)	17,280
Pratapgarh (3 vehicles × 2 trips × 2 × 34 km. × 30 days)	12,240
Devgarh (5 vehicles × 2 trips × 2 × 16 km. × 30 days)	9,600

2. Cost of diesel consumption

	Ramgarh	Pratapgarh	Devgarh
Total distance travelled (K.M.)	17,280	12,240	9,600
Mileage per litre of diesel	8 kmpl	10 kmpl	6 kmpl
Diesel consumption (Litre)	2,160 (17,280 ÷ 8)	1,224 (12,240 ÷ 10)	1,600 (9,600 ÷ 6)
Cost of diesel consumption @ ₹ 58 per litre (₹)	1,25,280	70,992	92,800

3. Servicing Cost

	Ramgarh	Pratapgarh	Devgarh
Total distance travelled (K.M.)	17,280	12,240	9,600
Covered under free service warranty	No	Yes	No
No. of services required	3 (17,280 k.m. ÷ 5,000 k.m.)	2 (12,240 k.m. ÷ 5,000 k.m.)	1 (9,600 k.m. ÷ 5,000 k.m.)
Total Service Cost (₹)	9,000 (₹ 3,000 × 3)	---	3,000 (₹ 3,000 × 1)

4. Calculation of Depreciation

	Ramgarh	Pratapgarh	Devgarh
No. of vehicles	4	3	5
Cost of a vehicle	11,02,000	13,12,000	9,25,000
Total Cost of vehicles	44,08,000	39,36,000	46,25,000
Depreciation per month	36,733 $\left(\frac{₹44,08,000 \times 10\%}{12 \text{ months}} \right)$	32,800 $\left(\frac{₹39,36,000 \times 10\%}{12 \text{ months}} \right)$	38,542 $\left(\frac{₹46,25,000 \times 10\%}{12 \text{ months}} \right)$

5. Total volume of Milk Carried

Route	Milk Qty. (Litre)
Ramgarh (25,000 ltr. × 0.7 × 4 vehicles × 3 trips × 30 days)	63,00,000
Pratapgarh (25,000 ltr. × 0.7 × 3 vehicles × 2 trips × 30 days)	31,50,000
Devgarh (25,000 ltr. × 0.7 × 5 vehicles × 2 trips × 30 days)	52,50,000
	1,47,00,000

Question 11

A mini-bus, having a capacity of 32 passengers, operates between two places - 'A' and 'B'. The distance between the place 'A' and place 'B' is 30 km. The bus makes 10 round trips in a day for 25 days in a month. On an average, the occupancy ratio is 70% and is expected throughout the year.

The details of other expenses are as under:

	Amount (₹)
<i>Insurance</i>	15,600 Per annum
<i>Garage Rent</i>	2,400 Per quarter
<i>Road Tax</i>	5,000 Per annum
<i>Repairs</i>	4,800 Per quarter
<i>Salary of operating staff</i>	7,200 Per month
<i>Tyres and Tubes</i>	3,600 Per quarter
<i>Diesel: (one litre is consumed for every 5 km)</i>	13 Per litre
<i>Oil and Sundries</i>	22 Per 100 km run
<i>Depreciation</i>	68,000 Per annum

8.23 Cost Accounting

Passenger tax @ 22% on total taking is to be levied and bus operator requires a profit of 25% on total taking.

Prepare operating cost statement on the annual basis and find out the cost per passenger kilometre and one way fare per passenger.

Solution:

Operating Cost Statement

	Particulars	Total Cost Per annum (₹)
A.	Fixed Charges:	
	Insurance	15,600
	Garage rent (₹ 2,400 × 4 quarters)	9,600
	Road Tax	5,000
	Salary of operating staff (₹ 7,200 × 12 months)	86,400
	Depreciation	68,000
	Total (A)	1,84,600
B.	Variable Charges:	
	Repairs (₹ 4,800 × 4 quarters)	19,200
	Tyres and Tubes (₹ 3,600 × 4 quarters)	14,400
	Diesel {(1,80,000 km. ÷ 5 km.) × ₹13}	4,68,000
	Oil and Sundries {(1,80,000 km. ÷ 100 km.) × ₹22}	39,600
	Total (B)	5,41,200
	Total Operating Cost (A+B)	7,25,800
	Add: Passenger tax (Refer to WN-1)	3,01,275
	Add: Profit (Refer to WN-1)	3,42,359
	Total takings	13,69,434

Calculation of Cost per passenger kilometre and one way fare per passenger:

$$\begin{aligned}\text{Cost per Passenger-Km.} &= \frac{\text{Total Operating Cost}}{\text{Total Passenger - Km.}} \\ &= \frac{₹ 7,25,800}{40,32,000 \text{ Passenger - Km.}} = ₹ 0.18\end{aligned}$$

$$\begin{aligned} \text{One way fare per passenger} &= \frac{\text{Total Takings}}{\text{Total Passenger - Km.}} \times 30 \text{ Km.} \\ &= \frac{\text{₹ } 13,69,434}{40,32,000 \text{ Passenger - Km.}} \times 30 \text{ km} = \text{₹ } 10.20 \end{aligned}$$

Working Notes:

1. Let total taking be X then Passenger tax and profit will be as follows:
 $X = \text{₹ } 7,25,800 + 0.22 X + 0.25 X$
 $X - 0.47 X = \text{₹ } 7,25,800$
 $X = \frac{\text{₹ } 7,25,800}{0.53} = \text{₹ } 13,69,434$

 Passenger tax = ₹ 13,69,434 × 0.22 = ₹ 3,01,275
 Profit = ₹ 13,69,434 × 0.25 = ₹ 3,42,359
 2. Total Kilometres to be run during the year
 = 30 km. × 2 sides × 10 trips × 25 days × 12 months = 1,80,000 Kilometres
 3. Total passenger Kilometres
 = 1,80,000 km. × 32 passengers × 70% = 40,32,000 Passenger- km.
-

Costing for Airlines

Question 12

In order to develop tourism, ABCL airline has been given permit to operate three flights in a week between X and Y cities (both side). The airline operates a single aircraft of 160 seats capacity. The normal occupancy is estimated at 60% through out the year of 52 weeks. The one-way fare is ₹ 7,200. The cost of operation of flights are:

<i>Fuel cost (variable)</i>	<i>₹ 96,000 per flight</i>
<i>Food served on board on non-chargeable basis</i>	<i>₹ 125 per passenger</i>
<i>Commission</i>	<i>5% of fare applicable for all booking</i>
<i>Fixed cost:</i>	
<i>Aircraft lease</i>	<i>₹ 3,50,000 per flight</i>
<i>Landing Charges</i>	<i>₹ 72,000 per flight</i>
<i>Required:</i>	

- (i) Calculate the net operating income per flight.

8.25 Cost Accounting

- (ii) The airline expects that its occupancy will increase to 108 passengers per flight if the fare is reduced to ₹ 6,720. Advise whether this proposal should be implemented or not.

Solution:

- (i) No. of passengers 160 seats \times 60% = 96

	(₹)	(₹)
Fare collection (96 passengers \times ₹7,200)		6,91,200
Variable costs:		
Fuel	96,000	
Food (96 passengers \times ₹125)	12,000	
Commission (5% of ₹6,91,200)	34,560	1,42,560
Contribution per flight		5,48,640
Fixed costs:		
Aircraft Lease	3,50,000	
Landing charges	72,000	4,22,000
Net income per flight		1,26,640

- (ii)

Fare collection (108 passengers \times ₹ 6,720)		7,25,760
Variable costs:		
Fuel	96,000	
Food (108 passengers \times ₹125)	13,500	
Commission (5% of ₹ 7,25,760)	36,288	1,45,788
Contribution		5,79,972

There is an increase in contribution by ₹ 31,332. Hence the proposal is acceptable.

Costing for Clubs and Library

Question 13

A Club runs a library for its members. As part of club policy, an annual subsidy of upto ₹ 5 per member including cost of books may be given from the general funds of the club. The management of the club has provided the following figures for its library department.

Number of Club members	5,000
Number of Library members	1,000

Library fee per member per month	₹ 100
Fine for late return of books	₹ 1 per book per day
Average No. of books returned late per month	500
Average No. of days each book is returned late	5 days
Number of available old books	50,000 books
Cost of new books	₹ 300 per book
Number of books purchased per year	1,200 books
Cost of maintenance per old book per year	₹ 10

Staff details	No.	Per Employee Salary per month (₹)
Librarian	01	10,000
Assistant Librarian	03	7,000
Clerk	01	4,000

You are required to calculate:

- (i) the cost of maintaining the library per year excluding the cost of new books;
- (ii) the cost incurred per member per month on the library excluding cost of new books; and
- (iii) the net income from the library per year.

If the club follows a policy that all new books must be purchased out of library revenue

- (a) What is the maximum number of books that can be purchased per year and
- (b) How many excess books are being purchased by the library per year?

Also, comment on the subsidy policy of the club

Solution:

	(₹)	(₹)
Total Revenue		
Library fees per month (1,000 members × ₹100)		1,00,000
Late fees per month (500 times × 5 books × ₹1)		2,500
Total Revenue per month		1,02,500
Total Revenue per annum (₹ 1,02,500 × 12 months)		12,30,000
Total Cost		
<i>Staff Costs:</i>		
Librarian (₹10,000 × 1 person × 12 months)	1,20,000	

8.27 Cost Accounting

Assistant Librarian (₹ 7,000 × 3 persons × 12 months)	2,52,000	
Clerk (₹ 4,000 × 1 person × 12 months)	48,000	4,20,000
Books maintenance cost (50,000 books × ₹ 10)		5,00,000
Total maintenance cost per annum excluding cost of new books		9,20,000
Cost incurred <i>per library member per annum</i> (₹ 9,20,000 ÷ 1,000)		920
Cost incurred <i>per library member per month</i> on the library excluding cost of new books (₹ 920 ÷ 12 months)		76.67
Cost incurred <i>per club member per annum</i> (₹ 9,20,000 ÷ 5,000)		184
Cost incurred <i>per club member per month</i> (₹ 184 ÷ 12 months)		15.33
Net income from the library per annum (₹ 12,30,000 – ₹ 9,20,000)		3,10,000
Cost per new book		300
Maximum number of new books per annum (₹ 3,10,000 ÷ ₹ 300)		1,033.33 nos.
Number of books purchased		1,200 nos.
Excess books purchased (1,200 nos. – 1,033.33 nos.)		166.67 nos.
Subsidy being given per annum on excess purchase (166.67 books × ₹ 300)		50,000
Subsidy per library member per annum (₹ 50,000 ÷ 1,000 members)		50
Subsidy per club member per annum (₹ 50,000 ÷ 5,000 members)		10

Comment: The club is exceeding its subsidy target to members by ₹ 45 (₹ 50 – ₹ 5) per library member and ₹ 5 (₹ 10 – ₹ 5) per club member.

Costing for Hotels & Lodges

Question 14

A company runs a holiday home. For this purpose, it has hired a building at a rent of ₹ 10,000 per month alongwith 5% of total taking. It has three types of suites for its customers, viz., single room, double rooms and triple rooms.

Following information is given:

Type of suite	Number	Occupancy percentage
Single room	100	100%
Double rooms	50	80%
Triple rooms	30	60%

The rent of double rooms suite is to be fixed at 2.5 times of the single room suite and that of triple rooms suite as twice of the double rooms suite.

The other expenses for the year 2013 are as follows:

	(₹)
Staff salaries	14,25,000
Room attendants' wages	4,50,000
Lighting, heating and power	2,15,000
Repairs and renovation	1,23,500
Laundry charges	80,500
Interior decoration	74,000
Sundries	1,53,000

Provide profit @ 20% on total taking and assume 360 days in a year.

You are required to calculate the rent to be charged for each type of suite.

Solution:

(i) **Total equivalent single room suites**

Nature of suite	Occupancy (Room-days)	Equivalent single room suites (Room-days)
Single room suites	36,000 (100 rooms × 360 days × 100%)	36,000 (36,000 × 1)
Double rooms suites	14,400 (50 rooms × 360 days × 80%)	36,000 (14,400 × 2.5)
Triple rooms suites	6,480 (30 rooms × 360 days × 60%)	32,400 (6,480 × 5)
		1,04,400

(ii) **Statement of total cost:**

	(₹)
Staff salaries	14,25,000
Room attendant's wages	4,50,000
Lighting, heating and power	2,15,000
Repairs and renovation	1,23,500
Laundry charges	80,500
Interior decoration	74,000

8.29 Cost Accounting

Sundries	<u>1,53,000</u>
	25,21,000
Building rent {(₹10,000 × 12 months) + 5% on total taking}	1,20,000 + 5% on total takings
Total cost	26,41,000 + 5% on total takings

Profit is 20% of total takings

∴ Total takings = ₹ 26,41,000 + 25% (5% + 20%) of total takings

Let x be rent for single room suite

Then $1,04,400 x = 26,41,000 + 0.25 \times 1,04,400 x$

Or, $1,04,400 x = 26,41,000 + 26,100 x$

Or, $78,300 x = 26,41,000$

Or, $x = 33.73$

(iii) Rent to be charged for single room suite = ₹ 33.73

Rent for double rooms suites ₹ $33.73 \times 2.5 = ₹ 84.325$

Rent for triple rooms suites ₹ $33.73 \times 5 = ₹ 168.65$
