

Chapter-wise Test (1007)**Service Costing****Instructions**

- All questions are compulsory.
- Test Duration will be one hour and 20 minutes, starting from 11:00 AM to 12:20 PM
- 5 minutes of reading time will be provided before 11, i.e. question paper will be shared by 10:55 AM.
- Share your scanned answer sheets by 12:25 on the below link
<https://forms.gle/wLRZWiTvMELNpCeC6>

1. A transport company has 20 vehicles, the capacities are as follows:

No. of Vehicles	Capacity per vehicle
5	9 MT
6	12 MT
7	15 MT
2	20 MT

The company provides the goods transport service between stations 'A' to station 'B'. Distance between these stations is 100 kilometers. Each vehicle makes one round trip per day on an 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 is related to the month of August, 2020:

Salary of Transport Manager	` 60,000
Salary of 30 drivers	` 20,000 each driver
Wages of 25 Helpers	` 12,000 each helper
Loading and unloading charges	` 850 each trip
Consumable stores (depends on running of vehicles)	` 1,35,000
Insurance (Annual)	` 8,40,000
Road Licence (Annual)	` 6,00,000
Cost of Diesel per litre	` 78
Kilometres run per litre each vehicle	5 Km.

Lubricant, Oil etc.	₹ 1,15,000
Cost of replacement of Tyres, Tubes, other parts etc. (on running basis)	₹ 4,25,000
Garage rent (Annual)	₹ 9,00,000
Routine mechanical services	₹ 3,00,000
Electricity charges (for office, garage and washing station)	₹ 55,000
Depreciation of vehicles (on time basis)	₹ 6,00,000

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 has been apportioned ₹88,000 by the workshop during the month. During the month operation was for 25 days.

You are required:

- (i) CALCULATE per ton-km operating cost.
- (ii) DETERMINE the freight to be charged per ton-km, if the company earned a profit of 25 per cent on freight. **(10 Marks)**

Solution:

Operating Cost Sheet for the month of August, 2020

Particulars		Amount (₹)
A.	Fixed Charges:	
	Manager's salary (₹60,000 × 60%)	36,000
	Drivers' Salary (₹20,000 × 30 drivers)	6,00,000
	Helpers' wages (₹12,000 × 25 helpers)	3,00,000
	Insurance (₹8,40,000 ÷ 12 months)	70,000
	Road licence (₹6,00,000 ÷ 12 months)	50,000
	Garage rent (₹9,00,000 ÷ 12 months)	75,000
	Routine mechanical services	3,00,000
	Electricity charges (for office, garage and washing station)	55,000
	Depreciation of vehicles	6,00,000
	Apportioned workshop expenses	88,000

	Total (A)	21,74,000
B.	Variable Charges:	
	Loading and unloading charges (Working Note 1)	7,65,000
	Consumable Stores	1,35,000
	Cost of diesel (Working Note 2)	14,04,000
	Lubricant, Oil etc.	1,15,000
	Replacement of Tyres, Tubes & other parts	4,25,000
	Total (B)	28,44,000
C.	Total Cost (A + B)	50,18,000
D.	Total Ton-Kms. (Working Note 3)	9,43,200
E.	Cost per ton-km. (C ÷ D)	5.32

(ii) Calculation of Chargeable Freight

Cost per ton-km.	₹ 5.32
Add: Profit @ 25% on freight or 33⅓% on cost	₹ 1.77
Chargeable freight per ton-km.	₹ 7.09

Working Notes:

1. Wages paid to loading and unloading labours

Numbers of vehicles available per day × No. of days × trips × wages per trip (20 vehicles × 90%) × 25 days × 2 trips × ₹ 850

$$18 \times 25 \times 2 \times 850 = ₹ 7,65,000$$

2. Cost of Diesel:

Distance covered by each vehicle during August, 2020

$$= 100 \text{ k.m.} \times 2 \times 25 \text{ days} \times 90\% = 4,500 \text{ km.}$$

$$\text{Consumption of diesel} = \frac{4,500 \text{ k.m.} \times 20 \text{ vehicles}}{5 \text{ k.m.}} = 18,000 \text{ litres}$$

$$\text{Cost of diesel} = 18,000 \text{ litres} \times ₹ 78 = ₹ 14,04,000.$$

3. Calculation of total ton-km:

$$\begin{aligned}
 \text{Total Ton-Km.} &= \text{Total Capacity} \times \text{Distance covered by each vehicle} \times \text{Average Capacity Utilisation ratio.} \\
 &= [(5 \times 9\text{mt}) + (6 \times 12 \text{ MT}) + (7 \times 15\text{MT}) + (2 \times 20 \text{ MT})] \times 4,500 \text{ K.M.} \times \frac{(90\% + 70\%)}{2} \\
 &= (45 + 72 + 105 + 40) \times 4,500 \text{ k.M.} \times 80\% \\
 &= 262 \times 4,500 \times 80\%. \\
 &= 9,43,200 \text{ ton-km.}
 \end{aligned}$$

2. VPS 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 8 km. The school works 22 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 a year are as under:

Driver's salary – payable for all the 12 in months	₹ 12,000 per month per driver
Cleaner's salary payable for all the 12 months	₹ 8,000 per month per cleaner
License fees, taxes etc.	₹ 8,400 per bus per annum
Insurance Premium	₹ 15,600 per bus per annum
Repairs and Maintenance	₹ 20,500 per bus per annum
Purchase price of the bus	₹ 20,00,000 each
Life of the bus	16 years
Scrap value	₹ 1,60,000
Diesel Cost	₹ 78.50 per litre

Each bus gives an average of 5 km. per litre of diesel. The seating capacity of each bus is 40 students.

The school follows differential transportation fees based on distance travelled as under:

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

Due to a pandemic, lockdown imposed on schools and the school remained closed from April 2020 to December 2020. Drivers and cleaners were paid 75% of their salary during the lockdown period. Repairing cost reduced to 75% for the year 2020.

Ignore the interest cost.

Required:

- (i) PREPARE a statement showing the expenses of operating a single bus and the fleet of 25 buses for a year.
- (ii) FIND OUT transportation fee per student per month in respect of:
 - (a) Students coming from a distance of upto 2 km. from the school.
 - (b) Students coming from a distance of upto 4 km. from the school; and
 - (c) Students coming from a distance of upto 8 km. from the school.
- (iii) CALCULATE the minimum bus fare that has to be recovered from the students for the year 2020. **(10 Marks)**

Solution:

- (i) **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)	2,21,056	55,26,400
<i>Repairs & maintenance costs: (B)</i>	20,500	5,12,500
<i>Fixed charges:</i>		
Driver's salary (₹ 12,000 × 12 months)	1,44,000	36,00,000
Cleaners salary (₹ 8,000 × 12 months)	96,000	24,00,000
Licence fee, taxes etc.	8,400	2,10,000

Insurance	15,600	3,90,000
Depreciation $\frac{\text{₹ } 20,00,000 - \text{₹ } 1,60,000}{16 \text{ years}}$	1,15,000	28,75,000
Total fixed charges: (C)	3,79,000	94,75,000
Total expenses: (A+B+C)	6,20,556	1,55,13,900

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

(a) 2 km. from the school $\{ \frac{6,20,556}{(236 \text{ students} \times 12 \text{ months})} \}$ (Refer to Working Note 2)	₹ 219.12
(b) 4 km. from the school (₹ 219.12 × 2)	₹ 438.24
(c) 8 km. from the school (₹ 219.12 × 4)	₹ 876.48

(iii) Calculation of minimum bus fare to be recovered from the students during the year 2020:

Statement showing the expenses of operating a single bus in year 2020

Particulars	Per bus per annum (₹)
<i>Running costs : (A)</i>	
Diesel (Refer to working note 3)	66,316.80
<i>Repairs & maintenance costs: (B)</i>	15,375
(₹ 20,500 × 0.75)	
<i>Fixed charges:</i>	
Driver's salary	1,17,000
{ ₹ 12,000 × 3 months + (75% of ₹ 12,000 × 9 months)}	
Cleaners salary	78,000
{ ₹ 8,000 × 3 months + (75% of ₹ 8,000 × 9 months)}	
Licence fee, taxes etc.	8,400
Insurance	15,600
Depreciation $\frac{\text{₹ } 20,00,000 - \text{₹ } 1,60,000}{16 \text{ years}}$	1,15,000
Total fixed charges: (C)	3,34,000

Total expenses: (A+B+C)	4,15,691.80
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Minimum bus fare to be recovered:

(a) 2 km. from the school { $4,15,691.8 / (236 \text{ students} \times 12 \text{ months})$ (Refer to Working Note 2)	₹ 146.78
(b) 4 km. from the school (₹ 146.78 × 2)	₹ 293.56
(c) 8 km. from the school (₹ 146.78 × 4)	₹ 587.12

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 (8 km. × 2 trips)	16 km.
Distance travelled per day by a bus (16 km. × 4 shifts)	64 km.
Distance travelled during a month (64 km. × 22 days)	1,408 km.
Distance travelled per year (1,408 × 10 months)	14,080 km.
No. of litres of diesel required per bus per year (14,080 km. ÷ 5 km.)	2,816 litres
Cost of diesel per bus per year (2,816 litres × ₹ 78.50)	₹ 2,21,056

2. Calculation of equivalent number of students per bus:

Bus capacity of 2 trips (40 students × 2 trips)	80 students
1/4 th fare students (15% × 80 students)	12 students
1/2 fare students (30% × 80 students × 2) (equivalent to 1/4 th fare students)	48 students
Full fare students (55% × 80 students × 4) (equivalent to 1/4 th fare students)	176 students
Total students equivalent to 1/4 th fare students	236 students

3. Calculation of diesel cost per bus in Year 2020:

Distance travelled during a month (64 km. × 22 days)	1,408 km.
Distance travelled during the year 2020 (1,408 × 3 months)	4,224 km.

No. of litres of diesel required per bus per year (4,224 km. ÷ 5 km.)	844.8 litres
Cost of diesel per bus per year (844.8 litres × ` 78.50)	` 66,316.80

3. Royal Transport Services runs fleet of buses within the limits of Jaipur city. The following are the details which were incurred by the company during October, 2021:

(₹)

Cost of each Bus	24,00,000
Garage Rent	1,00,000
Insurance	25,000
Road tax	20,000
Manager's Salary	60,000
Assistant's Salary (Two)	32,000 each
Supervisor's Salary (Three)	24,000 each
Driver's Salary (Twenty-Five)	20,000 each
Cleaner's Salary (Twenty)	5,000 each
Office Staff's Salary	1,00,000
Consumables	1,20,000
Repairs & Maintenance	90,000
Other Fixed Expenses	72,000
Diesel (10 Kms per Litre)	80 per litre
Oils & Lubricants	1,45,000
Tyres and tubes	35,000
Depreciation	10% p.a. on Cost

details are as below:

Capacity

12 Buses 60 Passengers

13 Buses 50 Passengers

Each bus makes 4 round trips a day covering a distance of 10 Kilometers in each trip (One Way) on an average. During the trips 80% of the seats are occupied. The annual records show that 5 buses are generally required to be kept away from roads each day for repairs.

You are required to CALCULATE cost per passenger-km. Cost sheet to be prepared on the basis of 25 buses. (10 Marks)

Solution:

Operating Cost Sheet

Particulars	Amount (₹)	Amount (₹)
<u>Standing Charges:</u>		
Depreciation (₹ 24,00,000 X 10% X 1/12 X 25)	5,00,000	
Garage Rent	1,00,000	
Insurance	25,000	
Road Tax	20,000	
Manager's Salary	60,000	
Assistant's Salary (₹ 32,000 X 2)	64,000	
Supervisor's Salary (₹ 24,000 X 3)	72,000	
Driver's Salary (₹ 20,000 X 25)	5,00,000	
Cleaner's Salary (₹ 5,000 X 20)	1,00,000	
Office Staff's Salary	1,00,000	
Consumables	1,00,000	
Repairs & Maintenance	1,20,000	
Other Fixed Expenses	90,000	
<u>Running Charges</u>	<u>72,000</u>	
Diesel (49,600 Kms / 10 Kms X ₹ 80 per unit)		18,23,000
Oils & Lubricants	3,96,800	
Tyres and tubes	1,45,000	
Total Operating Cost	<u>35,000</u>	
		<u>5,76,800</u>
		<u>23,99,800</u>

$$\begin{aligned} \text{Cost per passenger-km} &= \frac{\text{Total Operating Cost}}{\text{Passenger-kms}} \\ &= \frac{23,99,800}{27,18,080} \\ &= 0.883 \end{aligned}$$

Working Note:

Calculation of Total Kilometers and Passenger Kilometers

Specification	Total Km.	Passenger-Km.
12 Buses (60 Passengers)	29,760 Kms (10 Kms × 4 X 2 trips × 31 days × 12 Buses)	14,28,480 (29760 Kms x 60 Pass. x 80%)
13 Buses (50 Passengers)	32,240 Kms (10 Kms × 4 X 2 trips × 31 days × 13 Buses)	12,89,600 (32240 Kms x 50 Pass. x 80%)
Total	62,000	27,18,080

Since 5 buses out of 25 buses are kept for repairs every day

$$\text{Actual total Km.} = 62,000 \times 20/25 = 49,600$$

4. RST Toll Plaza Limited built a 80 kilometer long highway between two cities and operates a toll plaza to collect tolls from passing vehicles using the highway. The company has estimated that 50,000 light weight, 12,000 medium weight and 10,000 heavy weight vehicles will be using the highway in one month in outward journey and the same number for return journey.

As per government notification, vehicles used for medical emergencies, members of parliament, and essential services are exempt from toll charges. It is estimated that 10% of light weight vehicles will pass the highway for such use.

It is the policy of the company that if vehicles return within 24 hours of their outward journey. The toll fare will be reduced by 25 percent automatically. It is estimated 30% of chargeable light weight vehicles return within the specified time frame.

The toll charges for medium weight vehicles is to be fixed as 2.5 times of the light weight vehicles and that of heavy weight vehicles as 2 times of the medium weight vehicles.

The toll operating and maintenance cost for a month is ₹59,09,090. The company requires a profit of 10% over the total cost to cover interest and other costs.

[10 Marks]

Solution:

Working Notes:

- (1) Calculation of equivalent numbers of Light weight vehicles (when no concession is provided on return journey)

Type of vehicle	Monthly traffic (A)	Return traffic (B)	Ratio (C)	Equivalent light weight [(A + B) × C]
Light weight	45,000*	45,000	1	90,000
Medium weight	12,000	12,000	2.5	60,000
Heavy weight	10,000	10,000	5	<u>1,00,000</u>
				2,50,000

*50,000 light vehicles less 10% exempted vehicles

- (2) Calculation of equivalent numbers of Light weight vehicles (when concession is provided on return journey)

Type of vehicle	Monthly traffic (A)	Return traffic (B)	Ratio (C)	Equivalent light weight [(A + B) × C]
Light weight	45,000*	41,625 [45,000 - (45,000 × 30% × 25%)]	1	86,625
Medium weight	12,000	12,000	2.5	60,000
Heavy weight	10,000	10,000	5	1,00,000
				<u>2,46,625</u>

(i) Calculation of toll rate for each type of vehicle:

Total cost to cover ÷ Equivalent type of vehicles

(₹ 59,09,090 + 10% of ₹ 59,09,090) ÷ 2,50,000 equivalent vehicles (Refer working note 1)

= 65,00,000 ÷ 2,50,000 = ₹ 26

Toll rate for:

Light weight vehicle = ₹ 26

Medium weight vehicle = ₹ 26 × 2.5 = ₹ 65

Heavy weight vehicle = ₹ 26 × 5 = ₹ 130

(ii) Calculation of toll rate for each type of vehicle:

Revenue earned from Light weight vehicle in (i) above

= 90,000 vehicles × ₹ 26 = ₹ 23,40,000

New toll rate to maintain the same revenue from Light weight vehicle

= ₹ 23,40,000 ÷ 86,625 (Refer working note-2) = ₹ 27.01

Light weight vehicle = ₹ 27.01

Rate to be charged from 13,500 light weight vehicles = 27.01 × 0.75 = 20.26

Alternative presentation**(ii) Toll rate to be charged from light weight vehicles if concession applicable**

Revenue share in light vehicles = 90,000 × 26 = ₹ 23,40,000

Suppose rate is x, then outward journey 45,000 x; return journey (45,000 - 30% of 45,000) + 13,500 (x - 0.25)

45,000x + 31,500x + 13500 (0.75x) = ₹ 23,40,000

Toll rate to be charged from light weight vehicles : 86,625x = ₹ 23,40,000 = ₹ 27.01

Rate to be charged from 76,500 light weight vehicles @ 27.01; revenue will be ₹ 20,66,494

Rate to be charged from 13,500 light weight vehicles = 27.01 × 0.75 = 20.26
revenue will be ₹ 2,73,506