8. SERVICE COSTING

ASSIGNMENT SOLUTIONS

PROBLEM NO. 1

(i) Annual cost statement of three vehicles

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

(ii) Cost per km. run

$$\text{Cost per kilometer run} = \left(\frac{\text{Total annual cost of vehicles}}{\text{Total kilometer travelled annually}}\right) \text{(Refer WN 1)} = \left(\frac{\text{Rs. 6,00,436}}{\text{1,34,784 kms}}\right) = \text{Rs. 4.4548}$$

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

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

$$= \left(\frac{\text{Rs. 6,00,436}}{\text{5,25,312 kms}}\right) = \text{Rs. 1.143}$$

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

Working Notes:

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

Truck number	One way distance in kms	No. of trips (up & down)	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 km. × 24 days × 12 months) = Rs. 1,34,784

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

(1,824 tonnes km. × 24 days × 12 months) = 5,25,312

2. Depreciation Cost:

$$\text{Variable maintenance cost per km} = \frac{\text{Difference in maintenance cost}}{\text{Difference in distance travelled}}$$

$$= \frac{\text{Rs. 46,050} - \text{Rs. 45,175}}{\text{1,60,200 kms} - \text{1,56,700 kms}} = \text{Rs. 0.25}$$

Fixed maintenance cost = Total maintenance cost - Variable maintenance cost

= Rs. 46,050 - 1,60,200 kms × Rs. 0.25 = Rs. 6,000

PROBLEM NO. 2

(a) <u>Working Notes:</u>

Particulars	For 4 weeks	For 1 week (by dividing by 4)
Total distance travelled (40 km × 2 × 2 trips × 5 days × 4 weeks)	3,200 km	800 km
Total tonne km (40 km × 10 tonnes × 2 × 5 days × 4 weeks)	16,000 tonne km	4,000 tonne km

(i) Statement showing Operating Cost

	Particulars	For 4 weeks	For 1 week (by dividing by 4)
A.	**Fixed Charges:**		
	Drivers' wages (2,500 x 4 weeks	10,000	2,500
	Garage rent (`800 × 4 weeks)	3,200	800
	Insurance {(`18,200 ÷ 52 weeks) × 4 weeks}	1,400	350
	Vehicle license {(`7,800 ÷ 52 weeks) × 4 weeks}	600	150
	Other overheads cost {(`41,600 ÷ 52 weeks) × 4 weeks}	3,200	800
	Total (A)	18,400	4,600
B.	Running Cost:		
	Cost of diesel {(3,200 ÷ 8 kms) × 60}	24,000	6,000
	Engine Oil (`200 × 4 weeks)*	800	200
	Repairs (`600 × 4 weeks)*	2,400	600
	Depreciation on vehicle (9,50,000-1,50,000/1,60,000 km*3200 km)	16,000	4,000
	Depreciation on tyres (52,500/25,000 km*3200 km)	6,720	1,680
	Total (B)	49,920	12,480
C.	**Total (A+B)**	68,320	17,080

*Cost of engine oil & repairs may also be treated as fixed cost, as the question relates these with time i.e. in weeks instead of running of vehicle.

ii) Calculation of vehicle operating cost:

Operating cost per km.   =   68,320/3200 kms (or) 17,080/800 kms = 21.35

Operating cost per Tonne-km.   =   68,320/16,000 (or) 17,080/4000   = 4.27

PROBLEM NO: 3

i) Workings:

(a) Distance travelled in a month   = 40 k.m. × 2 × 2 trips × 5 days × 4 weeks

                                                            = 3,200 k.m.

(b) Total Tonne-km.   = 10 tonnes × 40 k.m. × 2 trips × 5 days × 4 weeks

                                                            = 16,000 tonne-k.m.

(c) Consumption of diesel   = 3,200 k.m. ÷ 10 k.m = 320 litre.

(d) Tyre cost   = 22,000 ÷ 80,000 k.m. × 3,200 k.m = `880

(e) Depreciation of van   = 16,00,000- 2,40,000/3,80,000k.m. x 3,200k.m. =11,453

Monthly Operating Cost Statement

Particulars	Rs.
Running costs:	
- Cost of diesel (320 ltr × 48)	15,360
- Lubricant oil (Rs. 600 × 4 weeks)	2,400

- Driver's salary	12,000
- Repairs & Maintenance	1,800
- Cost of tyres	880
- Depreciation	11,453
Total Running cost (A)	43,893
Fixed Costs:	
- Garage rent	4,800
- Insurance (Rs.5,400 ÷ 12)	450
- Permit fee (Rs.3,600 ÷ 12)	300
- Other overheads (Rs.66,000 ÷ 12)	5,500
Total fixed cost (B)	11,050
Total cost {(A) + (B)}	54,943

(ii) Operating Cost per kilo metre = 54,943/3,200km = 17.17

Cost per tonne-km = 54,943/16,000tonne –km. = 3.43

PROBLEM NO: 4

Working Note:

1. **Total Kilometers run per annum:**

   = Number of Buses × Distance × Number of days in the Month × Number of trips × 12 months

   = 1 Bus ×40 kms × 25 Days × 6 Single trips (3 Round Trips) × 12 months = 72,000 kms.

2. **Total Passenger Kilometers per annum:**

   Total Kilometers run per annum × Seating Capacity

   = 72,000 Kms × 40 Seats = 28,80,000 Passenger-Kms.

3. **Petrol & oil Consumption per annum:**

   Total Kilometers run per annum × Petrol Consumption per km.

   = 72,000 Kms × (Rs.500 / 100 Kms) = Rs. 3,60,000

4. **Loading:** If Taking is Rs.100, then Rs.10 will have to be given as Commission and Rs.15 remain as Profit. The Cost is therefore, be Rs.75. On Rs.75, the loading must be Rs.25 to make the Taking equal to Rs.100.

Statement of Cost per Passenger - Km

Particulars	Per Annum	Per Passenger - Kilometer
A. Standing Charges:		
Insurance @ 3% on Rs.10,00,000	30,000	
Taxation	20,000	
Manager-cum-accountant's salary	84,000	
Depreciation	2,00,000	
Stationary	12,000	
Total Standing Charges	3,46,000	0.12014
B. Running Charges:		
Diesel and other Oil	3,60,000	
Salary of Driver	36,000	
Salary of Conductor	24,000	
Total Running Charges	4,20,000	0.14583
C. Maintenance Charges:		
Garage Rent @ Rs.2,000 Per month	24,000	
Repairs	20,000	

Total Maintenance Charges	44,000	0.01528
Grand Total (A + B + C)	8,10,000	0.28125
Loading @ 25/75		0.09375
Fare per Passenger Kilometer		0.37500

PROBLEM NO: 5

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 (Rs.)	Fleet of 25 buses per annum (Rs.)
Running costs: (A)		
Diesel (Refer to working note 1)	56,832	14,20,800
Repairs & maintenance costs: (B)	16,400	4,10,000
Fixed charges:		
Driver's salary(Rs. 5,000 × 12 months)	60,000	15,00,000
Cleaners salary(Rs.3,000 × 1/5th × 12 months)	7,200	1,80,000
License 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

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

a) 4 km. from the school {Rs. 2,52,082 / (354 students × 12 months)} (Refer to WN 2)	Rs. 59.34
b) 8 km. from the school (Rs. 59.34 ×2)	Rs. 118.68
c) 16 km. from the school (Rs. 59.34 × 4)	Rs. 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 × Rs. 18.50)	Rs. 56,832

2. Calculation of number of students per bus:

Bus capacity of 2 trips (60 students × 2 trips)	120 students
¼th fare students (15% × 120 students)	18 students
½ fare 30% students (equivalent to ¼th fare students)	72 students
Full fare 55% students (equivalent to ¼th fare students)	264 students
Total ¼th fare students	354 students

PROBLEM NO: 6

i)   Statement of operating income of DKG Airlines for Melbourne-Delhi flight (one way)

Particulars	Amount (Rs.)	Amount (Rs.)
Fare received (per flight): 250 passengers × Rs. 50,000		1,25,00,000
Variable costs (per flight):		

- Fuel cost	28,00,000	
- Food (250 × Rs. 2,600)	6,50,000	
- Commission to Travel Agents (15% of Rs. 1,25,00,000)	18,75,000	(53,25,000)
Contribution per flight		71,75,000
Fixed cost (per flight):		
Annual lease cost	15,30,000	
Fixed ground service costs	1,70,000	
Salaries of flight crew	6,50,000	(23,50,000)
Operating income per flight		48,25,000

ii) **Operating income of DKG Airlines per Melbourne-Delhi flight (one way) after reduction in fare**

Fare received (per flight): 275 passengers × Rs. 48,000		1,32,00,000
Variable costs (per flight):		
Fuel cost	28,00,000	
Food (275 × Rs.2,600)	7,15,000	
Commission to Travel Agents (17.5% of Rs.1,32,00,000)	23,10,000	(58,25,000)
Contribution per flight		73,75,000

Excess contribution due to lowering of fare (Rs.73,75,000 - Rs.71,75,000) = Rs.2,00,000. DKG Airlines should lower its fare as it would increase its contribution by Rs.2,00,000.

PROBLEM NO: 7

WORKING NOTES:

i) **Total equivalent single room suites**

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

ii) **Statement of total cost**

Particulars	Amount (Rs.)
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
Sundries	1,53,000
Building rent [(Rs.10,000 x 12 months) + 5% on total takings]	1,20,000 + (5% On Total Takings)
Total Cost	26,41,000 + (5% On Total Takings)

Profit is 20% on Total takings

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

Let x be rent for single room suite.

The 1,04,400 x = 26,41,000 + 0.25 x 1,04,400 x

∴ x = 33.73

iii) Rent to be charged for single room suite = Rs. 33.73

Rent for double rooms suite = Rs.33.73 x 2.5 = Rs.84.325

Rent for triple room suites = Rs.33.73 x 5 = Rs.168.65

Alternative:

Let x be the total takings & Profit is 20% on total takings

Total takings	= 26,41,000 + 5% on total takings + 20% on total takings
X	= 26,41,000 + 5% on x + 20% on x
X	= 26,41,000 + 25%x
X - 0.25x	= 26,41,000
0.75x	= 26,41,000
X	$= \dfrac{26,41,000}{0.75}$
X	= Rs.35,21,333.33

Total Takings = Rs.35,21,333.33

iv) **Rent to be charged**

Single Room suite	$= \dfrac{35,21,333.333}{1,04,400}$	= Rs.33.73
Double Room Suite	= 33.73 x 2.5	= Rs.84.325
Triple Room Suite	= 33.73 x 2.5 x 2	= Rs.168.65

PROBLEM NO.8

Statement showing total cost of nonresident hotel

Particulars	Amount (Rs.)
Staff salaries (Given)	22,00,000
Repairs	4,20,000
Linen	4,50,000
Interior decoration	5,00,000
Sundries	3,15,500
Depreciation (1,40,00,000 x 5% + 10,00,000 x 10% + 20,00,000 x 10%)	10,00,000
Room-attendant's Wages (Working Note 2)	9,31,500
Lighting's cost (Working Note 3)	5,54,000
Power cost (Working Note 4)	2,77,000
Total Cost	66,48,000
Add: profit on cost @ 25% $\left(66,48,000 \times \dfrac{25}{100} \right)$	1,66,200
Amount to be collected	83,10,000

Rent to be charged:

Deluxe	$: \dfrac{Rs.83,10,000}{41,550 \ Rooms}$	= Rs.200
Super Deluxe	: Rs.200 x 1.5 times	= Rs.300
Executive Deluxe	: Rs.200 x 2 times	= Rs.400

Working Note 1: Calculation of No of Room days per annum

Particulars	Deluxe	Super Deluxe	Executive Deluxe
Summer	18,900 (100 x 90% 30 x7)	5,040	2,520
Winter	7,500 (100 x 50% x 30 x 5)	900	600
	26,400	5,940	3,120

Working Note 2: Calculation of Room Attendant's Wages per annum

Particulars	Amounts (Rs.)
Deluxe = [18,900 x Rs.20 + 7500 x Rs.30]	6,03,000
Super Deluxe = [5,040 x Rs.30 + 900 x Rs.45]	1,91,700
Executive Deluxe = [2,520 x Rs.40 + 600 x Rs.60]	1,36,800
	9,31,500

Working Note 3: Calculation of lighting cost

Particulars	Amount (Rs.)
Deluxe = $\left(26,400 \times \dfrac{Rs.400}{30\,days}\right)$	3,52,000
Super deluxe = $\left(5,940 \times \dfrac{Rs.600}{30\,days}\right)$	1,18,800
Executive deluxe = $\left(3,120 \times \dfrac{Rs.800}{30\,days}\right)$	83,200
	5,54,000

Working Note 4: Calculation of power cost

Particulars	Amount (Rs.)
Deluxe = $\left(26,400 \times \dfrac{Rs.200}{30\,days}\right)$	1,76,000
Super deluxe = $\left(5,940 \times \dfrac{Rs.300}{30\,days}\right)$	59,400
Executive deluxe = $\left(3,120 \times \dfrac{Rs.400}{30\,days}\right)$	41,600
	2,77,000

Working Note 5:

Calculation of Equivalent Rooms days	No. Of Room Days
Deluxe Rooms (26,400 x 1 time)	26,400
Super deluxe Rooms (5,940 x 1.5 times)	8,910
Executive deluxe Rooms(3,120 x 2 times)	6,240
	41,550

PROBLEM NO: 9

ICU days = 300 days

Permanent staff: 6 (1 supervisor, 2 nurses and 3 ward boys)

Salary of supervisor: Rs. 2,000 per month

Salary of Nurses: Rs. 2,000 per month (each)

Salary of Ward boys: Rs. 1,000 per month (each)

25 beds + 5 extra beds each extra bed at Rs. 10 per day

Full capacity (25 beds)	: 120 patient days
Only 60% capacity (15 beds)	: 120 patient days
Capacity with extra beds	: 60 patient days (Total hiring charges for an year for beds: Rs. 2,000)
	: 300 patient days

Outside doctor's fees: Rs. 3,00,000 per annum

Fixed expenses: Rs. 48,000 per annum

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a)   **Statement showing profit**

Particulars	Amount (Rs.)	Amount (Rs.)
Total Revenue (6,500 x 100)		6,50,000
Fixed charges:		
Rent (5,000 x 12)	60,000	
Supervisor's salary (2,000 x 12)	24,000	
Salary of Nurses (2,000 x 2 x 12)	48,000	
Salary of ward boys (1,000 x 3 x 12)	36,000	
Other Fixed Expenses	48,000	2,16,000
Operating expenses:		
Extra Beds rent per annum	2,000	
Payment to outside doctors	3,00,000	3,02,000
Profit		1,32,000

$$\text{Profit per patient day} = \frac{1,32,000}{6,500 \text{ (patient days per patient bed) (Refer WN)}} = \text{Rs. } 20.30$$

b) Given that, Total Revenue = Total Cost

No. of patient days = x

$$100 x = 2,16,000 + \left(\frac{3,02,000}{6,500}\right) x$$

$$100 x = 2,16,000 + (46.461) x$$

$$53.539 x = 2,16,000$$

$$x = \left(\frac{2,16,000}{53.539}\right) = 4,034.48 \cong 4,035$$

Charges per patient per day = Rs. 100

Profit per patient day =?

At Break-even point, Total Cost = Total Revenue

Working Notes: Patient beds

Full (100%) Capacity (25 beds) = 120 days x 25 beds = 3,000

60% Capacity (15 beds)   = 120 days x 15 beds = 1,800

                          =   60 days x 25 beds = 1,500

Extra Beds $\left(\dfrac{2,000}{\text{Rs. }10}\right)$ =   200

                    Patient beds   = 6,500

PROBLEM NO: 10

Number of Patient Days = (200 x 50) + (105 x 30) + (60 x 20) = 14,350 + 250 = 14,600 patient days

Statement Showing Profit

Elements of Cost and Revenue	Total (Rs.)
A. Revenue (14,600 x Rs. 2,500)	3,65,00,000
B. Variable Costs	
Food and Laundry Service	39,53,000
Medicines to Patients	22,75,000
Doctor's Payment	66,00,000
Hire Charges of Bed (250 x Rs. 950)	2,37,500
Total Variable Cost	1,30,65,500

C. Fixed Costs	
Building Rent	27,00,000
Manager's Salary (Rs. 50,000 x 3 x 12)	18,00,000
Nurse's Salary (Rs. 18,000 x 12 x 24)	51,84,000
Ward boy's Salary (Rs. 9,000 x 12 x 24)	25,92,000
Administrative Overheads	28,00,000
Depreciation on Equipment's	12,75,000
	1,63,51,000
D. Total Cost (B + C)	**2,94,16,500**
E. Profit (A - D)	**70,83,500**

Profit per patient day = Rs. 70,83,500/14,600 = Rs. 485.17

i) Contribution (per patient day) = (Rs. 3,65,00,000 - Rs. 1,30,65,500)/ 14,600 = Rs. 1,605.10

ii) BEP = 1,63,51,000/1,605.10 = 10,186.90 or say 10,187 patient days

Notes:

1. Higher Charges for extra beds are a semi variable cost; still, for the sake of convenience it has been considered a variable cost.

2. Assumed, the hospital hired 250 beds at a charge of Rs. 950 per bed to accommodate the flow of patients. However, this never exceeded the 10 beds above the normal capacity of 50 beds on any day.

3. The fees were paid based on the number of patients attended to and the time spent by them, which on an average worked out to Rs. 5,50,000 p.m.

PROBLEM NO: 11

Statement showing monthly steam production cost:

Particulars	Amount (Rs.)
Cost of coal (Rs.16 per quintal x 1,400 Quintals)	22,400
Water $\left(1,50,000 \text{ liters} \times \dfrac{Rs.1}{1,000 \text{ liters}}\right)$	150
Freight and handling of coal (Rs. 22,400 x 10%)	2,240
Net sales of ash (Rs.1,540 - Rs.200)	(1,340)
Repairs and maintenance $\left(Rs.2,000 \times \dfrac{1}{2}\right)$	1,000
Stores $\left(Rs.\ 1,500 \times \dfrac{2}{3}\right)$	1,000
Supervision and administrative costs $\left(Rs.\ 2,500 \times \dfrac{3}{5}\right)$	1,500
Wages and salaries (Rs.150 x 50 men)	7,500
Depreciation $\left(\dfrac{Rs.\ 62,000 - Rs.\ 2000}{10\ yrs} \times \dfrac{1}{12\ months}\right)$	500
Total Cost	34,950

Cost per Therm / Unit $= \dfrac{Rs.\ 34,950}{40,000\ therms\,(given)} = Rs\ 0.874$

Statement showing total cost of electricity generation:

Particulars	Amount (Rs.)
steam cost $\left(Rs.34,950 \times \dfrac{4}{5}\right)$	27,960
Repairs and maintenance (Rs. 2,000 x 0.5)	1000

Stores $\left(Rs.1,500 \times \dfrac{1}{3}\right)$	500
Supervision and administration cost (2,500 x 2/5)	1000
Dep. On G.P $\left(\dfrac{Rs.1,00,000 - Rs.4,000}{10\,years} \times \dfrac{1}{12}\right)$	800
Wages and salaries (10 men x Rs.300)	3000
	34,260

$\therefore$ Cost of generating electricity = $\dfrac{Rs.34,260}{3,00,000\,units}$ = Rs. 0.1142 per unit

WORKING NOTE:

Total Electricity generated = 3,10,000 units

Less: Normal Loss in Units =   10,000 units   3,00,000 units

PROBLEM NO. 12

Statement of cost

Particulars	Working Note	(Rs.)
A. Apportionment of capital cost	$\left(\dfrac{Rs.600\,crore}{10\,years} \times \dfrac{1}{12\,months}\right)$	5,00,00,000
B. Operating Cost		
Salary to Collection	Personnel (3 Shifts × 4 persons per shift × 30 days ×Rs.150 per day)	54,000
Salary to Supervisor	(2 Shifts × 1 persons per shift × 30 days ×Rs.250 per day)	15,000
Salary to Security Personnel	(3 Shifts × 2 persons per shift × 30 days ×Rs.150 per day)	27,000
Salary to Toll Booth Manager	(2 Shifts × 1 person per shift × 30 days ×Rs.400 per day)	24,000
Electricity		80,000
Telephone		40,000
		2,40,000
C. Maintenance cost		30,00,000
Total (A + B + C)		**5,32,40,000**

i) Calculation of cost per kilometer:

$= \dfrac{Total\,cost}{Total\,km.} = \dfrac{Rs.\,5,32,40,000}{60\,km.} = Rs.\,8,87,333.33$

ii) Calculation of toll rate per vehicle:

$= \dfrac{Total\,cost + 25\%\,profit}{Vehicles\,per\,month} = \dfrac{Rs.5,32,40,000 + Rs.1,33,10,000}{50,00,000\,vehicles} = Rs.13.31$

WORKING:

No. of vehicles using the highway per month:

$\dfrac{Total\,estimated\,vehicles}{10\,years} \times \dfrac{1\,month}{12\,months} = \dfrac{60\,crore}{10\,years} \times \dfrac{1\,month}{12\,months} = 50\,lakhs$

THE END