Discuss the cost accounting method for service sectors.
State the units used in different service sectors.
Calculate the costs for different service industries.
12.1 INTRODUCTION

Service sector, being a fastest growing sector and having a significant contribution towards the GDP in India, is a very important sector where the role of the cost and management accounting is inevitable. The competitiveness of a service entity is very much dependent on a robust cost and management accounting system for competitive pricing and identification of value adding activities. Providers of services like transportation, hotels, financial services & banking, insurance, electricity generation, transmission and distribution etc. are very much cost conscious and thrive to provide services in a cost effective manner. Irrespective of regulatory requirements to maintain cost records and get the records audited, service costing becomes integral and inseparable part of each service entity. In this chapter, we will be discussing how costing is done in service sectors like Transportation, Toll roads, Electricity generation, transmission and distribution, Hospitals, Canteen & Restaurants, Hotels & Lodges, Educational institutes, Financial institutions, Insurance, Information Technology (IT) & Information Technology Enabled Services (ITES) etc.

Service costing is also known as operating costing.

12.1.1 Application of Service Costing:

Internal: The service costing is required for in-house services provided by a service cost centre to other responsibility centres as support services. Examples of support services are Canteen and hospital for staff, Boiler house for supplying steam to production departments, Captive Power generation unit, operation of fleet of vehicles for transport of raw material to factory or distribution of finished goods to the market outlets, IT department services used by other departments, research & development, quality assurance, laboratory etc.

External: When services are offered to outside customers as a profit centre in consonance with organisational objectives as an output like goods or passenger transport service provided by a transporter, hospitality services provided by a hotel, provision of services by financial institutions, insurance and IT companies etc.

In both the situation, all costs incurred are collected, accumulated for a certain period or volume, recorded in the cost accounting system and then expressed in terms of a cost unit of service.

12.1.2 Service Costing versus Product Costing:

Service costing differs from product costing (such as job or process costing) in the following ways due to some basic and peculiar nature.

(i) Unlike products, services are intangible and cannot be stored, hence, there is no inventory for the services.
(ii) Use of Composite cost units for cost measurement and to express the volume of outputs.

(iii) Unlike a product manufacturing, employee (labour) cost constitutes a major cost element than material cost.

(iv) Indirect costs like administration overheads are generally have a significant proportion in total cost of a service as unlike manufacturing sector, service sector heavily depends on support services and traceability of costs to a service may not economically feasible.

12.2 SERVICE COST UNIT

To compute the Service cost, it is necessary to understand the unit for which the cost is to be computed. All the costs incurred during a period are collected and analyzed and then expressed in terms of a cost per unit of service.

One specific issue with service costing is the difficulty in defining a realistic cost unit that represents a suitable measure of the service provided. The cost unit to be applied needs to be defined carefully and frequently, a composite cost unit may be deemed more appropriate.

For example, Hotels may use the ‘Occupied Room Days’ as an appropriate unit for cost ascertainment and control.

Other typical cost unit that may be used include:

<table>
<thead>
<tr>
<th>Service industry</th>
<th>Unit of cost (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Services</td>
<td>Passenger- km., (In public transportation)</td>
</tr>
<tr>
<td></td>
<td>Quintal- km., or Ton- km. (In goods carriage)</td>
</tr>
<tr>
<td>Electricity Supply</td>
<td>Kilowatt- hour (kWh)</td>
</tr>
<tr>
<td>Hospital</td>
<td>Patient per day, room per day or per bed, per operation etc.</td>
</tr>
<tr>
<td>Canteen</td>
<td>Per item, per meal etc.</td>
</tr>
<tr>
<td>Cinema</td>
<td>Per ticket.</td>
</tr>
<tr>
<td>Hotels</td>
<td>Guest Days or Room Days</td>
</tr>
<tr>
<td>Bank or Financial</td>
<td>Per transaction, per services (e.g. per letter of credit, per</td>
</tr>
<tr>
<td>Institutions</td>
<td>application, per project etc.)</td>
</tr>
<tr>
<td>Educational Institutes</td>
<td>Per course, per student, per batch, per lecture etc.</td>
</tr>
<tr>
<td>IT &amp; ITES</td>
<td>Cost per project, per module etc.</td>
</tr>
<tr>
<td>Insurance</td>
<td>Per policy, Per claim, Per TPA etc.</td>
</tr>
</tbody>
</table>

The costing should be comprehensive enough to show the effects like off-season and peak-season demand, full time, part time, etc.
12.2.1 Methods for ascertaining Service Cost Unit:

Composite Cost Unit:

Sometime two measurement units are combined together to know the cost of service or operation. These are called composite cost units. For example, a public transportation undertaking would measure the operating cost per passenger per kilometre.

Examples of Composite units are Ton- km., Quintal- km, Passenger-km., Patient-day etc. Composite unit may be computed in two ways.

(i) Absolute (Weighted Average) basis

(ii) Commercial (Simple Average) basis.

In both bases of computation of service cost unit, weightage is also given to qualitative factors rather quantitative (which are directly related with variable cost elements) factors alone.

(i) Weighted Average or Absolute basis– It is summation of the products of qualitative and quantitative factors. For example, to calculate absolute Ton-Km for a goods transport is calculated as follows:

\[
\sum (\text{Weight Carried } \times \text{Distance})_1 + (\text{Weight Carried } \times \text{Distance})_2 + \ldots + (\text{Weight Carried } \times \text{Distance})_n
\]

Similarly, in case of Cinema theatres, price for various classes of seats are fixed differently. For example–

First class seat may be provided with higher quality service and hence charged at a higher rate, whereas Second Class seat may be priced less. In this case, appropriate weight to be given effect for First Class seat and Second Class seat – to ensure proper cost per composite unit.

(ii) Simple Average or Commercial basis – It is the product of average qualitative and total quantitative factors. For example, in case of goods transport, Commercial Ton-Km is arrived at by multiplying total distance km., by average load quantity.

\[
\sum (\text{Distance}_1 + \text{Distance}_2 + \ldots + \text{Distance}_n) \times \left( \frac{W_1 + W_2 + \ldots + W_n}{n} \right)
\]

In both the example, variable cost is dependent of distance and is a quantitative factor. Since, the weight carried does not affect the variable cost hence and is a qualitative factor.

To understand the concept of absolute ton-km., and commercial ton-km., the following illustration may be referred.

ILLUSTRATION 1

A Lorry starts with a load of 20 MT of Goods from Station ‘A’. It unloads 8 MT in Station ‘B’ and balance goods in Station ‘C’. On return trip, it reaches Station ‘A’
with a load of 16 MT, loaded at Station ‘C’. The distance between A to B, B to C and C to A are 80 Kms, 120 Kms and 160 Kms, respectively. Compute “Absolute MT-Kilometer” and “Commercial MT – Kilometer”.

\( MT = \) Metric Ton or Ton.

**SOLUTION**

**Weighted Average or Absolute basis : MT-Kilometer :**

\[
\begin{align*}
(20 \text{ MT} \times 80 \text{ Kms}) & + (12 \text{ MT} \times 120 \text{ Kms}) + (16 \text{ MT} \times 160 \text{ Kms}) \\
= & 1,600 + 1,440 + 2,560 = 5,600 \text{ MT-Kilometer}
\end{align*}
\]

**Simple Average or Commercial basis : MT-Kilometer :**

\[
\begin{align*}
[(20+12+16) / 3] \text{ MT} \times [(80+120+160) \text{ Kms}] \\
= & 16 \text{ MT} \times 360 \text{ Kms} = 5,760 \text{ MT–Kilometer}
\end{align*}
\]

**Equivalent Cost Unit/ Equivalent service Unit :**

To calculate cost or pricing of two more different grade of services which uses common resources, each grade of service is assigned a weight and converted into equivalent units. Converting services into equivalent units make different grade of services equivalent and comparable.

**For Example :**

A hotel has three types of suites for its customers, viz., Standard, Deluxe and Luxurious

Following information is given:

<table>
<thead>
<tr>
<th>Type of suite</th>
<th>Number of rooms</th>
<th>Room Tariff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>100</td>
<td>--</td>
</tr>
<tr>
<td>Deluxe</td>
<td>50</td>
<td>2.5 times of the Standard suits</td>
</tr>
<tr>
<td>Luxurious</td>
<td>30</td>
<td>Twice of the Deluxe suits</td>
</tr>
</tbody>
</table>

The rent of Deluxe suite is to be fixed at 2.5 times of the Standard suite and that of Luxurious suite as twice of the Deluxe suite.

Since, the all three types of suits uses same amount of overheads but to attach qualitative weight, these rooms are required to be converted into equivalent units. This can be done in two ways

**(i) Making all suits equivalent to Standard suits :**

<table>
<thead>
<tr>
<th>Nature of suite</th>
<th>Occupancy (Room-days)</th>
<th>Equivalent single room suites (Room-days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>36,000</td>
<td>36,000</td>
</tr>
<tr>
<td>Deluxe</td>
<td>18,000</td>
<td>45,000</td>
</tr>
</tbody>
</table>

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Luxurious  |  10,800  |  54,000  
|   (30 rooms × 360 days) |   (10,800 × 5) |   1,35,000 |

Or

(ii) Making all suits equivalent to Luxurious suits:

<table>
<thead>
<tr>
<th>Nature of suite</th>
<th>(36,000 × 1/5)</th>
<th>Equivalent Luxurious suites (Room-days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>36,000 (100 rooms × 360 days)</td>
<td>7,200 (36,000 × 1/5)</td>
</tr>
<tr>
<td>Deluxe</td>
<td>18,000 (50 rooms × 360 days)</td>
<td>9,000 (18,000 × 1/2)</td>
</tr>
<tr>
<td>Luxurious</td>
<td>10,800 (30 rooms × 360 days)</td>
<td>10,800 (10,800 × 1)</td>
</tr>
</tbody>
</table>

12.3 STATEMENT OF COSTS FOR SERVICE SECTORS

For preparing a statement of cost or a cost sheet for service sector, costs are usually collected and accumulated for a specified period viz. A month, quarter or a year, etc.

The cost statement for services may be prepared either on the basis of functional classification as done for product costing or on the basis of variability. Cost sheet on the basis of variability is prepared classifying all the costs into three different heads:

1. Fixed costs or Standing charges
2. Variable costs or Operating expenses
3. Semi-variable costs or Maintenance expenses

Note: In the absence of information about semi-variable costs, the costs would be shown under fixed and variable heads only.

Treatment of Depreciation:

If related to effluxion of time or calculated on time basis, will be treated as fixed. However, if the depreciation is calculated on the basis of activity level or usage, it will be treated as variable cost.

Treatment of Interest:

Interest and finance charges shall be presented in the cost statement as a separate item of cost of sales. In general, interest is treated as fixed cost, unless otherwise given.

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12.4 COSTING OF TRANSPORT SERVICES

Transport organizations can be divided into two categories viz. Goods transport and Passenger transport.

The cost unit for Goods transport organization is Ton– Kilometer – that means cost of carrying one Ton of goods over a distance of one kilometer.

Cost unit for Passenger transport organization is Passenger– Kilometer – that means cost of carrying one Passenger over a distance of one kilometer.

The costs are shown under the following heads:

(i) **Standing Charges or Fixed costs**: These are the fixed costs that remain constant irrespective of the distance travelled. These costs include the following:
   - Insurance
   - License fees
   - Salary to Driver, Conductor, Cleaners, etc if paid on monthly basis
   - Garage costs, including garage rent
   - Taxes
   - Administration expenses, etc

(ii) **Variable costs or Running costs**: These costs are generally associated with the distance travelled. These costs include the following:
   - Petrol and Diesel
   - Lubricant oils,
   - Wages to Driver, Conductor, Cleaners, etc if it is related to operations
   - Any other variable costs identified.

(iii) **Semi-variable costs or Maintenance costs**: These costs include the following:
   - Repairs and maintenance
   - Tyres
   - Spares, etc

**ILLUSTRATION 2**

AXA Passenger Transport Company is running 5 buses between two towns, which are 40 kms apart. Seating capacity of each bus is 40 passengers. Following details are available from their books, for the month of April 20X7:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary of Drivers, Cleaners and Conductors</td>
<td>24,000</td>
</tr>
<tr>
<td>Salary to Supervisor</td>
<td>10,000</td>
</tr>
<tr>
<td>Diesel and other Oil</td>
<td>40,000</td>
</tr>
<tr>
<td>Repairs and Maintenance</td>
<td>8,000</td>
</tr>
</tbody>
</table>
Actual passengers carried were 75% of the seating capacity. All the four buses run on all days for the month. Each bus made one round trip per day. Calculate cost per passenger – Kilometer.

**SOLUTION**

**Working Note:**

Total Passenger Kilometers = 
Number of Buses × Distance × Seating Capacity × Used Capacity × Number of days in the Month × Number of trips 
= 5 Buses × 40 kms. × 40 Seats × 75% × 30 Days × 2 Single trips (1 Round Trip) 
= 3,60,000 Passenger-Kms.

Cost per Passenger-Km = \( \frac{\text{Total costs}}{\text{Total Passenger Kilometers}} \)

**Statement of Cost per Passenger – Km**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Cost Per Month</th>
<th>Cost per Passenger – Km</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Standing Charges</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wages of Drivers, Cleaners and Conductors</td>
<td>24,000</td>
<td></td>
</tr>
<tr>
<td>Salary to Supervisor</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>Taxation and Insurance</td>
<td>16,000</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>26,000</td>
<td></td>
</tr>
<tr>
<td>Interest</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>Total Standing Charges</td>
<td>96,000</td>
<td>0.267</td>
</tr>
<tr>
<td><strong>B. Running Charges</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel and other Oil</td>
<td>40,000</td>
<td>0.111</td>
</tr>
<tr>
<td><strong>C. Maintenance Charges</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repairs and Maintenance</td>
<td>8,000</td>
<td>0.022</td>
</tr>
<tr>
<td>Total</td>
<td>1,44,000</td>
<td>0.400</td>
</tr>
</tbody>
</table>

Cost per Passenger-Km = ₹ 0.40
ILLUSTRATION 3

ABC Transport Company has given a route 40 kilometers long to run bus.

(a) The bus costs the company a sum of ₹10,00,000
(b) It has been insured at 3% p.a. and
(c) The annual tax will amount to ₹20,000
(d) Garage rent is ₹2,000 per month.
(e) Annual repairs will be ₹20,000
(f) The bus is likely to last for 5 years
(g) The driver’s salary will be ₹3,000 per month and the conductor’s salary will be ₹2,000 per month in addition to 10% of takings as commission [To be shared by the driver and conductor equally].
(h) Cost of stationery will be ₹1,000 per month.
(i) Manager-cum-accountant’s salary is ₹7,000 per month.
(j) Petrol and oil will be ₹500 per 100 kilometers.
(k) The bus will make 3 up and down trips carrying on an average 40 passengers on each trip.
(l) The bus will run on an average 25 days in a month.

Assuming 15% profit on takings, calculate the bus fare to be charged from each passenger.

SOLUTION

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 × (₹500 / 100 Kms) = ₹3,60,000

(4) Loading : If Taking is ₹100, then ₹10 will have to be given as Commission and ₹15 remain as Profit. The Cost is therefore, be ₹75. On ₹75, the loading must be ₹25 to make the Taking equal to ₹100.
Statement of Cost per Passenger – Km

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Per Annum</th>
<th>Per Passenger - Kilometer</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Standing Charges:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance @ 3% on ₹10,00,000</td>
<td>30,000</td>
<td></td>
</tr>
<tr>
<td>Taxation</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>Manager-cum-accountant’s salary</td>
<td>84,000</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>2,00,000</td>
<td></td>
</tr>
<tr>
<td>Stationary</td>
<td>12,000</td>
<td></td>
</tr>
<tr>
<td>Total Standing Charges</td>
<td>3,46,000</td>
<td>0.12014</td>
</tr>
<tr>
<td><strong>B. Running Charges:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diesel and other Oil</td>
<td>3,60,000</td>
<td></td>
</tr>
<tr>
<td>Salary of Driver</td>
<td>36,000</td>
<td></td>
</tr>
<tr>
<td>Salary of Conductor</td>
<td>24,000</td>
<td></td>
</tr>
<tr>
<td>Total Running Charges</td>
<td>4,20,000</td>
<td>0.14583</td>
</tr>
<tr>
<td><strong>C. Maintenance Charges:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Garage Rent @ ₹2,000 Per month</td>
<td>24,000</td>
<td></td>
</tr>
<tr>
<td>Repairs</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>Total Maintenance Charges</td>
<td>44,000</td>
<td>0.01528</td>
</tr>
<tr>
<td>Grand Total (A+B+C)</td>
<td>8,10,000</td>
<td>0.28125</td>
</tr>
<tr>
<td>Loading @ 25/75</td>
<td></td>
<td>0.09375</td>
</tr>
<tr>
<td>Fare per Passenger Kilometer</td>
<td></td>
<td>0.37500</td>
</tr>
</tbody>
</table>

Fare per Passenger-Km = ₹ 0.375

**ILLUSTRATION 4**

SMC is a public school having five buses each plying in different directions for the transport of its school students. In view of a larger 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 work-load 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 the 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 25 days in a month and remains closed for vacation in May, June and December. Bus fee, however, is payable by the students for all 12 months in a year.
The details of expenses for a year are as under:

- **Driver’s salary**: ₹ 4,500 per month per driver
- **Cleaner’s salary**: ₹ 3,500 per month

(Salary payable for all 12 months)

(one cleaner employed for all the five buses)

- **Licence fee, taxes, etc.**: ₹ 8,600 per bus per annum
- **Insurance**: ₹ 10,000 per bus per annum
- **Repairs & maintenance**: ₹ 35,000 per bus per annum
- **Purchase price of the bus**: ₹ 15,00,000 each
- **Life of each bus**: 12 years
- **Scrap value of buses at the end of life**: ₹ 3,00,000
- **Diesel cost**: ₹ 45.00 per litre

Each bus gives an average mileage of 4 km. per litre of diesel.

Seating capacity of each bus is 50 students.

The seating capacity is fully occupied during the whole year.

Students picked up and dropped within a range up to 4 km. of distance from the school are charged half fare and fifty per cent of the students travelling in each trip are in this category. Ignore interest. Since the charges are 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 five buses for a year.

(ii) Work out the average cost per student per month in respect of –

(A) students coming from a distance of upto 4 km. from the school and

(B) students coming from a distance beyond 4 km. from the school.

**SOLUTION**

(i) **Statement of Expenses of operating bus/ buses for a year**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Rate (₹)</th>
<th>Per Bus per annum (₹)</th>
<th>Fleet of 5 buses p.a. (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Standing Charges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Driver’s salary</td>
<td>4,500 p.m</td>
<td>54,000</td>
<td>2,70,000</td>
</tr>
<tr>
<td>Cleaner’s salary</td>
<td>3,500 p.m</td>
<td>8,400</td>
<td>42,000</td>
</tr>
<tr>
<td>Licence fee, taxes etc.</td>
<td>8,600 p.a.</td>
<td>8,600</td>
<td>43,000</td>
</tr>
<tr>
<td>Insurance</td>
<td>10,000 p.a.</td>
<td>10,000</td>
<td>50,000</td>
</tr>
</tbody>
</table>
(i) **Depreciation**: 
\[
\text{Depreciation} = \frac{15,00,000 - 3,00,000}{12 \text{ yrs}} \quad 1,00,000 \text{ p.a.} \quad 1,00,000 \quad 5,00,000
\]

(ii) **Maintenance Charges**:  
<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (p.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repairs &amp; maintenance</td>
<td>35,000</td>
</tr>
</tbody>
</table>

(iii) **Operating Charges**:  
<table>
<thead>
<tr>
<th>Item</th>
<th>Cost (p.a.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel (Working Note 1)</td>
<td>1,62,000</td>
</tr>
</tbody>
</table>

Total Cost [\(i) + (ii) + (iii)\]:  
\[
3,78,000 \quad 18,90,000
\]

Cost per month:  
\[
31,500 \quad 1,57,500
\]

Total no. of equivalent students:  
\[
150 \quad 750
\]

Total Cost per half fare equivalent student:  
\[
\text{Rs} \ 210 \quad \text{Rs} \ 210
\]

(ii) **Average cost per student per month**:  

A. **Students coming from distance of upto 4 km. from school**  
\[
\text{Average cost} = \frac{\text{Total cost per month}}{\text{Total no. of equivalent students}} = \frac{\text{Rs} \ 31,500}{150 \text{ students}} = \text{Rs} \ 210
\]

B. **Students coming from a distance beyond 4 km. from school**  
\[
\text{Average cost} = \text{Cost of per half fare student} \times 2 = \text{Rs} \ 210 \times 2 = \text{Rs} \ 420
\]

**Working Notes**:  

1. **Calculation of Diesel cost per bus**:  
   - Distance travelled in a year: (8 round trip \( \times \) 8 km. \( \times \) 25 days \( \times \) 9 months)  
   - Distance travelled p.a.: 14,400 km.  
   - Cost of diesel (per bus p.a.):  
     \[
     \frac{14,400 \text{ km.}}{4 \text{ kmpl}} \times \text{Rs} \ 45 = \text{Rs} \ 1,62,000
     \]

2. **Calculation of equivalent number of students per bus**:  
   - Seating capacity of a bus: 50 students  
   - Half fare students (50% of 50 students): 25 students  
   - Full fare students (50% of 50 students): 25 students  

   **Total number of students equivalent to half fare students**:  
   - Full fare students (25 students \( \times \) 2): 50 students  
   - Add: Half fare students: 25 students  
   - Total Equivalent number of students in a trip: 75 students  
   - Total number of equivalent students in two trips (Senior + Junior): 150 students

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ILLUSTRATION 5

Global Transport Ltd. charges ₹ 90 per ton for its 6-ton truck lorry load from city 'A' to city 'B'. The charges for the return journey are ₹ 84 per ton. No concession or reduction in these rates is made for any delivery of goods at intermediate station 'C'.

In January 20X8, the truck made 12 outward journeys for city 'B' with full load out of which 2 tons were unloaded twice in the way at city 'C'. The truck carried a load of 8 tons in its return journey for 5 times but was once caught by police and ₹ 1,200 was paid as fine. For the remaining trips the truck carried full load out of which all the goods on load were unloaded once at city 'C', but it returned without any load once only from 'C' station to 'A' station. The distance from city 'A' to city 'C' and city 'B' are 140 km. and 300 km. respectively.

Annual fixed costs and maintenance charges are ₹ 60,000 and ₹ 12,000 respectively. Running charges spent during January 20X8 are ₹ 2,944.

You are required to find out the cost per absolute ton-kilometre and the profit for January, 20X8.

SOLUTION

Calculation of total monthly cost for running truck.

<table>
<thead>
<tr>
<th></th>
<th>Amount per annum (₹)</th>
<th>Amount per month (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Standing Charges:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Annual fixed costs</td>
<td>60,000</td>
<td>5,000</td>
</tr>
<tr>
<td>(ii) Maintenance Charges:</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12,000</td>
<td>1,000</td>
</tr>
<tr>
<td>(iii) Running Cost:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running charges</td>
<td>2,944</td>
<td></td>
</tr>
<tr>
<td>Total monthly cost</td>
<td></td>
<td>8,944</td>
</tr>
</tbody>
</table>

Cost per absolute tonne-km. = ₹ 8,944 / 44,720 ton-km. = ₹ 0.20

(Refer to working note)

Calculation of profit for the month of January 20X8:

<table>
<thead>
<tr>
<th></th>
<th>(₹)</th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck hire charges received during the month:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From Outward journey (12 trips × 6 ton × ₹ 90)</td>
<td>6,480</td>
<td></td>
</tr>
<tr>
<td>From return journey</td>
<td>6,888</td>
<td>13,368</td>
</tr>
<tr>
<td>{(5 trips × 8 ton × ₹ 84) + (7 trips × 6 ton × ₹ 84)}</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less: Monthly running cost</td>
<td>8,944</td>
<td></td>
</tr>
<tr>
<td>Fine paid for overloading</td>
<td>1,200</td>
<td>(10,144)</td>
</tr>
<tr>
<td>Profit earned for the month</td>
<td></td>
<td>3,224</td>
</tr>
</tbody>
</table>
Working Notes:

Calculation of Absolute Ton-km:

<table>
<thead>
<tr>
<th></th>
<th>Ton-km.</th>
<th>Ton-km.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outward journeys:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From city A to city B (10 journey × 300 km. × 6 ton)</td>
<td>18,000</td>
<td></td>
</tr>
<tr>
<td>From city A to city C (2 journeys × 140 km. × 6 ton)</td>
<td>1,680</td>
<td></td>
</tr>
<tr>
<td>From city C to city B (2 journeys × 160 km. × 4 ton)</td>
<td>1,280</td>
<td>20,960</td>
</tr>
<tr>
<td><strong>Return journeys:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From city B to city A (5 journeys × 300 km. × 8 ton) + (6 journeys × 300 km. × 6 ton)</td>
<td>22,800</td>
<td></td>
</tr>
<tr>
<td>From city B to city C (1 journey × 160 km. × 6 ton)</td>
<td>960</td>
<td>23,760</td>
</tr>
<tr>
<td><strong>Total Absolute Ton-km</strong></td>
<td></td>
<td>44,720</td>
</tr>
</tbody>
</table>

Note: (i) While calculating absolute ton-km., actual load carried are considered irrespective of the fact it attracts fines or penalty. (ii) Fine paid for overloading is an abnormal expenditure and is not included in the operating cost of the bus. This amount will be debited to Costing Profit and Loss A/c.

12.5 COSTING FOR HOTELS AND LODGES

Service costing is an effective tool in respect if hotel industry. Hotels are run on commercial basis. Hence it is necessary to compute the cost - to fix the price of various services provided by the hotel and to find out the profit or loss at the end of a particular period.

In this case, the costs associated with different services offered should be identified and cost per unit should be worked out. The cost unit may be Guest-day or Room day. For calculation of cost per Guest day or Room day, estimated occupancy rate – at different point of time, for example – Peak season or lien season, are taken in to account.

ILLUSTRATION 6

A company runs a holiday home. For this purpose, it has hired a building at a rent of ₹10,000 per month along with 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:

<table>
<thead>
<tr>
<th>Type of suite</th>
<th>Number</th>
<th>Occupancy percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single room</td>
<td>100</td>
<td>100%</td>
</tr>
<tr>
<td>Double rooms</td>
<td>50</td>
<td>80%</td>
</tr>
<tr>
<td>Triple rooms</td>
<td>30</td>
<td>60%</td>
</tr>
</tbody>
</table>
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 20X8 are as follows:

<table>
<thead>
<tr>
<th>Nature of suite</th>
<th>Occupancy (Room-days)</th>
<th>Equivalent single room suites (Room-days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single room suites</td>
<td>36,000 (100 rooms × 360 days × 100%)</td>
<td>36,000 (36,000 × 1)</td>
</tr>
<tr>
<td>Double rooms suites</td>
<td>14,400 (50 rooms × 360 days × 80%)</td>
<td>36,000 (14,400 × 2.5)</td>
</tr>
<tr>
<td>Triple rooms suites</td>
<td>6,480 (30 rooms × 360 days × 60%)</td>
<td>32,400 (6,480 × 5)</td>
</tr>
</tbody>
</table>

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**

**Working Notes:**

(i) Total equivalent single room suites

(ii) Statement of total cost:
Interior decoration  |  74,000
Sundries           |  1,53,000
                             |   25,21,000

Building rent {((₹10,000 × 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% of total takings
∴ Total takings = ₹ 26,41,000 + 25% (5% +20%) of total takings
Let R be rent for single room suite
Then 1,04,400 R = 26,41,000 + (0.25 × 1,04,400 R)
Or, 1,04,400 R = 26,41,000 + 26,100 R
Or, 78,300 R = 26,41,000
Or, R = ₹ 33.73

Rent to be charged:
Rent to be charged for single room suite = ₹ 33.73
Rent for double rooms suites = ₹ 33.73 × 2.5 = ₹ 84.33
Rent for triple rooms suites = ₹ 33.73 × 5 = ₹ 168.65

ILLUSTRATION 7
A lodging home is being run in a small hill station with 100 single rooms. The home offers concessional rates during six off-season months in a year. During this period, half of the full room rent is charged. The management’s profit margin is targeted at 20% of the room rent. The following are the cost estimates and other details for the year ending on 31st March 20X7. [Assume a month to be of 30 days].

(i) Occupancy during the season is 80% while in the off-season it is 40% only.
(ii) Total investment in the home is ₹ 200 lakhs of which 80% relate to buildings and balance for furniture and equipment.
(iii) Expenses:
   o Staff salary [Excluding room attendants] : ₹ 5,50,000
   o Repairs to building                      : ₹ 2,61,000
   o Laundry charges                         : ₹ 80,000
   o Interior                                : ₹ 1,75,000
   o Miscellaneous expenses                 : ₹ 1,90,800
(iv) Annual depreciation is to be provided for buildings @ 5% and on furniture and equipment @ 15% on straight-line basis.
(v) Room attendants are paid ₹ 10 per room day on the basis of occupancy of the rooms in a month.

(vi) Monthly lighting charges are ₹120 per room, except in four months in winter when it is ₹30 per room and this cost is on the basis of full occupancy for a month. You are required to work out the room rent chargeable per day both during the season and the off-season months on the basis of the foregoing information.

**SOLUTION**

**Working Notes:**

(i) Total Room days in a year

<table>
<thead>
<tr>
<th>Season</th>
<th>Occupancy (Room-days)</th>
<th>Equivalent Full Room charge days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Season – 80% Occupancy</td>
<td>100 Rooms × 80% × 6 months × 30 days in a month = 14,400 Room Days</td>
<td>14,400 Room Days × 100% = 14,400</td>
</tr>
<tr>
<td>Off-season – 40% Occupancy</td>
<td>100 Rooms × 40% × 6 months × 30 days in a month = 7,200 Room Days</td>
<td>7,200 Room Days × 50% = 3,600</td>
</tr>
<tr>
<td>Total Room Days</td>
<td>14,400+7,200 = 21,600 Room Days</td>
<td>18,000 Full Room days</td>
</tr>
</tbody>
</table>

(ii) Lighting Charges:

It is given in the question that lighting charges for 8 months is ₹120 per month and during winter season of 4 months it is ₹30 per month. Further it is also given that peak season is 6 months and off season is 6 months.

It should be noted that – being Hill station, winter season is to be considered as part of Off season. Hence, the non-winter season of 8 months include – Peak season of 6 months and Off season of 2 months.

Accordingly, the lighting charges are calculated as follows:

<table>
<thead>
<tr>
<th>Season</th>
<th>Occupancy (Room-days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Season &amp; Non-winter – 80% Occupancy</td>
<td>100 Rooms × 80% × 6 months × ₹120 per month = ₹ 57,600</td>
</tr>
<tr>
<td>Off-season &amp; Non-winter – 40% Occupancy (8 – 6 months)</td>
<td>100 Rooms × 40% × 2 months × ₹120 per month = ₹ 9,600</td>
</tr>
<tr>
<td>Off-season &amp; -winter – 40% Occupancy months)</td>
<td>100 Rooms × 40% × 4 months × ₹ 30 per month = ₹ 4,800</td>
</tr>
<tr>
<td>Total Lighting charges</td>
<td>₹ 57,600+9,600+4,800 = ₹72,000</td>
</tr>
</tbody>
</table>
Statement of total cost:

<table>
<thead>
<tr>
<th>Description</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff salary</td>
<td>5,50,000</td>
</tr>
<tr>
<td>Repairs to building</td>
<td>2,61,000</td>
</tr>
<tr>
<td>Laundry &amp; Linen</td>
<td>80,000</td>
</tr>
<tr>
<td>Interior</td>
<td>1,75,000</td>
</tr>
<tr>
<td>Sundries Expenses</td>
<td>1,90,800</td>
</tr>
<tr>
<td>Depreciation on Building (₹ 200 Lakhs × 80% × 5%)</td>
<td>8,00,000</td>
</tr>
<tr>
<td>Depreciation on Furniture &amp; Equipment (₹ 200 Lakhs × 20% × 15%)</td>
<td>6,00,000</td>
</tr>
<tr>
<td>Room attendant’s wages (₹ 10 per Room Day for 21,600 Room Days)</td>
<td>2,16,000</td>
</tr>
<tr>
<td>Lighting charges</td>
<td>72,000</td>
</tr>
<tr>
<td>Total cost</td>
<td>29,44,800</td>
</tr>
<tr>
<td>Add: Profit Margin (20% on Room rent or 25% on Cost)</td>
<td>7,36,200</td>
</tr>
<tr>
<td>Total Rent to be charged</td>
<td>36,81,000</td>
</tr>
</tbody>
</table>

**Calculation of Room Rent per day**

Total Cost / Equivalent Full Room days = ₹36,81,000/18,000 = ₹204.50

Room Rent during Season = ₹204.50

Room Rent during Off season = ₹204.50 × 50% = ₹102.25

---

12.6 COSTING FOR HOSPITALS

A Hospital is providing various types of medical services to the patients. Hospital costing is applied to decide the cost of these services.

A hospital may have different departments catering to varied services to the patients – such as

- Out Patient
- In Patient
- Medical services like X-Ray, Scanning, etc.
- General services like Catering, Laundry, Power house, etc.
- Miscellaneous services like Transport, Dispensary, etc.

12.6.1 Unit of Cost

Common unit of costs of various departments are as follows:

- Out Patient – Per Out-patient
- In Patient – Per Room Day
- Scanning – Per Case
- Laundry – Per 100 items laundered

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12.6.2 Cost segregation

The cost of hospital can be divided into fixed costs and variable costs. Fixed costs are based on timelines and irrespective of services provided. For example, Staff salaries, Depreciation on Building and Equipment, etc. Variable costs vary with the level of services rendered. For example, Laundry charges, Cost of food supplied to patients, Power, etc.

ILLUSTRATION 8

ABC Hospital runs a Critical Care Unit (CCU) in a hired building. CCU consists of 35 beds and 5 more beds can be added, if required.

Rent per month - ₹ 75,000
Supervisors – 2 persons – ₹ 25,000 Per month – each
Nurses – 4 persons – ₹ 20,000 per month – each
Ward Boys – 4 persons – ₹ 5,000 per month – each
Doctors paid ₹ 2,50,000 per month – paid on the basis of number of patients attended and the time spent by them

Other expenses for the year are as follows:
Repairs (Fixed) – ₹ 81,000
Food to Patients (Variable) – ₹ 8,80,000
Other services to patients (Variable) – ₹ 3,00,000
Laundry charges (Variable) – ₹ 6,00,000
Medicines (Variable) – ₹ 7,50,000
Other fixed expenses – ₹ 10,80,000
Administration expenses allocated – ₹ 10,00,000

It was estimated that for 150 days in a year 35 beds are occupied and for 80 days only 25 beds are occupied.
The hospital hired 750 beds at a charge of ₹ 100 per bed per day, to accommodate the flow of patients. However, this does not exceed more than 5 extra beds over and above the normal capacity of 35 beds on any day.

You are required to –
(a) Calculate profit per Patient day, if the hospital recovers on an average ₹ 2,000 per day from each patient
(b) Find out Breakeven point for the hospital.

SOLUTION

Working Notes:
(1) Calculation of number of Patient days
\[
\begin{align*}
35 \text{ Beds} \times 150 \text{ days} & = 5,250 \\
25 \text{ Beds} \times 80 \text{ days} & = 2,000 \\
\text{Extra beds} & = 750 \\
\text{Total} & = 8,000
\end{align*}
\]

**Statement of Profitability**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Amount</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Income for the year</strong> (₹ 2,000 per patient per day × 8,000 patient days)</td>
<td></td>
<td>1,60,00,000</td>
</tr>
<tr>
<td><strong>Less : Variable Costs :</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Doctor Fees (₹ 2,50,000 per month × 12)</td>
<td>30,00,000</td>
<td></td>
</tr>
<tr>
<td>Food to Patients (Variable)</td>
<td>8, 80,000</td>
<td></td>
</tr>
<tr>
<td>Other services to patients (Variable)</td>
<td>3, 00,000</td>
<td></td>
</tr>
<tr>
<td>Laundry charges (Variable) – (₹)</td>
<td>6, 00,000</td>
<td></td>
</tr>
<tr>
<td>Medicines (Variable) – (₹)</td>
<td>7, 50,000</td>
<td></td>
</tr>
<tr>
<td>Bed Hire Charges (₹100 × 750 Beds)</td>
<td>75,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Variable costs</strong></td>
<td></td>
<td>56,05,000</td>
</tr>
<tr>
<td>Contribution</td>
<td></td>
<td>1,03,95,000</td>
</tr>
<tr>
<td><strong>Less : Fixed Costs :</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rent (₹ 75,000 per month × 12)</td>
<td>9,00,000</td>
<td></td>
</tr>
<tr>
<td>Supervisor (2 persons × ₹25,000 × 12)</td>
<td>6,00,000</td>
<td></td>
</tr>
<tr>
<td>Nurses (4 persons × ₹ 20,000 × 12)</td>
<td>9,60,000</td>
<td></td>
</tr>
<tr>
<td>Ward Boys (4 persons × ₹ 5,000 × 12)</td>
<td>2,40,000</td>
<td></td>
</tr>
<tr>
<td>Repairs (Fixed)</td>
<td>81,000</td>
<td></td>
</tr>
<tr>
<td>Other fixed expenses – (₹)</td>
<td>10, 80,000</td>
<td></td>
</tr>
<tr>
<td>Administration expenses allocated – (₹)</td>
<td>10, 00,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total Fixed Costs</strong></td>
<td></td>
<td>48,61,000</td>
</tr>
<tr>
<td><strong>Profit</strong></td>
<td></td>
<td>55,34,000</td>
</tr>
</tbody>
</table>

(1) Calculation of Contribution per Patient day

\[
\text{Contribution per Patient day} = \frac{1,03,95,000}{8,000} = ₹1,299.375
\]

\[
\text{Breakeven Point} = \frac{\text{Fixed Cost}}{\text{Contribution per Patient day}} = \frac{48,61,000}{1,299.375} = 3,741 \text{ patient days}
\]
12.7 COSTING FOR IT & ITES

Information Technology (IT) and Information Technology Enabled Services (ITES) organizations provide their customers with services or intangible products. These organizations are highly labour intensive.

The services of IT and ITES organizations may be used for – provision of services to outside customers or provision of services internally (captive consumption).

In this sector employee (labour) cost constitutes a significant portion of the total operating costs. The direct employee cost is traceable to services rendered.

In addition to employee cost, significant overhead costs for offering the services are incurred and are classified as service overhead. To arrive at the cost incurred for rendering the services, it is necessary to allocate / apportion such overheads to cost units.

12.7.1 Concept of Project

In general – IT & ITES industries, the jobs undertaken are considered as Project. Each project is unique in nature and varies in size, functionality requirements, duration and staffing requirements.

When a project is taken up, a detailed planning is done – by breaking down the project into number of activities and their dependencies. Based on the above, project scheduling are developed.

Then the skill level requirement for carrying out each of the activities is identified and the duration of each and every activity would be ascertained. This process is known as effort estimation.

Once the skill level and duration is identified, then required man-power is identified for carrying out the activities.

Normally, project scheduling and effort estimation is carried out together. The costs of development are primarily the costs of the effort involved, so the effort computation is used in both the cost and the schedule estimate.

12.7.2 Effort involved

Direct Manpower

In a typical software implementation project, three to four levels of man-power would be directly engaged, as mentioned below:

- Software Engineers / Functional Consultants / Business Analysts
- Project Leaders
- Project Manager
- Program Manager, etc

Depending on the nature and complexities of the projects being implemented, the
number of persons engaged, their levels and duration of the engagement varies. For example, in a multi-continental, multi-time zone software implementation projects, in addition to the above man-power, Customer Account Manager, Portfolio Manager, etc may be involved.

The costs incurred on the above listed man-power are traceable with a project and hence forming part of direct costs of the project.

**Support Man-power**

In addition to the above persons, who are directly engaged in project, there could be support persons or indirect manpower, who are indirectly involved in the project.

For example, Quality Assurance Team, Testing team, Version Control team, Staffing Manager, etc who are indirectly support the projects by providing required level of support services over the life of the projects.

It is possible that the indirect manpower may be involved in more than one project, simultaneously. Their time spent, may or may not be traced on any particular project and will be used across multiple projects.

If their time can be identified with a project, they will be treated as direct manpower. Accordingly, the cost incurred on them will be treated as direct cost. However, if their time is not traceable with a single project, then it may either be allocated or apportioned to various projects on some suitable basis. Accordingly, the cost incurred on them will be treated as overhead and the same will be apportioned to various projects on some suitable basis.

Effort Cost in these types of organizations are calculated on the basis of cost per Person day or cost per Person week or cost per Person month. That means cost incurred for a person for rendering services per day or per week or per month.

Depending on the requirement of the customer, the periodicity will be defined. For example, implementation of new software may require eight to twelve person months. In such a case, the cost will be calculated on Per Person month basis. On the other hand, implementation of one or two new functionality in already implemented (existing) software may require one or two week’s efforts. In such a case, the cost will be calculated on per Person week basis.

**12.7.3 Parameters in computation of total cost**

**A. Hardware and software costs involved**

- If they are identifiable with a project, then they are directly allocated to the project
- If they are not directly identifiable with a project or not fully allocable to a project, then they are treated as service overhead
B. Travel and training costs
- If they are incurred for a project, then they are directly allocated to the project.
- If they are not directly identifiable with a project or allocable over a number of projects, then they are treated as service overhead. For example, Java (software language) training provided to the software engineers, may useful in multiple Java based projects. Hence treated as overhead costs.

C. Effort costs
- Effort costs are basically identified with a project. They can be classified as direct cost, unless otherwise specified.
- Effort costs are not just the salaries of the software engineers or programmers who are involved in the project. Organisations compute effort costs in terms of overhead costs where they take the total cost of running the organisation and divide this by the number of productive staff. Therefore, the following costs are all part of the total effort cost:
  1. Costs of providing, heating and lighting office space
  2. Costs of support staff such as accountants, administrators, system managers, cleaners and technicians
  3. Costs of networking and communications
  4. Costs of central facilities such as a library or recreational facilities
  5. Costs of Social Security and employee benefits such as pensions and health insurance, etc.

In short, effort cost includes Salary of the staff concerned and part of common overhead.

**ILLUSTRATION 9**
Following are the data pertaining to Infotech Pvt. Ltd, for the year 20X6-X7

<table>
<thead>
<tr>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary to Software Engineers</td>
</tr>
<tr>
<td>(5 persons)</td>
</tr>
<tr>
<td>Salary to Project Leaders</td>
</tr>
<tr>
<td>(2 persons)</td>
</tr>
<tr>
<td>Salary to Project Manager</td>
</tr>
<tr>
<td>Repairs &amp; maintenance</td>
</tr>
<tr>
<td>Administration overheads</td>
</tr>
</tbody>
</table>

The company executes a Project XYZ, the details of the same as are as follows:

Project duration – 6 months

One Project Leader and three Software Engineers were involved for the entire duration of the project, whereas Project Manager spends 2 months’ efforts, during the execution of the project.
Travel expenses incurred for the project – ₹1,87,500
Two Laptops were purchased at a cost of ₹ 50,000 each, for use in the project and the life of the same is estimated to be 2 years

Prepare Project cost sheet

SOLUTION

Working Notes:

(1) Calculation of Cost per month and Overhead absorption rate

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Total Per Annum</th>
<th>Per Person Per Annum</th>
<th>Per Person Per Month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary to Software Engineer (5 Persons)</td>
<td>₹15,00,000</td>
<td>₹ 3,00,000</td>
<td>₹ 25,000</td>
</tr>
<tr>
<td>Salary to Project Leaders (2 persons)</td>
<td>₹ 9, 00,000</td>
<td>₹ 4,50,000</td>
<td>₹ 37,500</td>
</tr>
<tr>
<td>Salary to Project Manager</td>
<td>₹ 6,00,000</td>
<td>₹ 6,00,000</td>
<td>₹ 50,000</td>
</tr>
<tr>
<td>Total</td>
<td>₹ 30,00,000</td>
<td></td>
<td>₹ 1,12,500</td>
</tr>
</tbody>
</table>

(2) Total Overhead = Repairs & maintenance + Administration overheads
= ₹ 3, 00,000 + ₹12, 00,000 = ₹15,00,000

(3) Calculation of Overhead absorption rate
= Total Overhead / Total Salary = ₹15,00,000 / ₹30,00,000 = 50%

Project Cost Sheet

<table>
<thead>
<tr>
<th></th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salary Cost:</td>
<td></td>
</tr>
<tr>
<td>Salary of Software Engineers</td>
<td>4,50,000</td>
</tr>
<tr>
<td>Salary of Project Leader</td>
<td>2,25,000</td>
</tr>
<tr>
<td>Salary of Project Manager</td>
<td>1,00,000</td>
</tr>
<tr>
<td>Total Salary</td>
<td>7,75,000</td>
</tr>
<tr>
<td>Overheads (50% of Salary)</td>
<td>3,87,500</td>
</tr>
<tr>
<td>Travel Expenses</td>
<td>1,87,500</td>
</tr>
<tr>
<td>Depreciation on Laptops</td>
<td>25,000</td>
</tr>
<tr>
<td>Total Project Cost</td>
<td>13,75,000</td>
</tr>
</tbody>
</table>

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horizon and evaluated by a common yardstick. The economic analysis involves comparison of project costs and benefits under the “with” and “without” project conditions.

The project is further subjected to sensitivity analysis by assessing the effects of adverse changes in the key variables. In addition, the combined effect of these changes is also assessed. This helps to gauge the economic strength of the project to withstand future risks and uncertainties.

12.8.1 Cost Involved

The project cost consists of following two main components:

**12.8.1.1 Capital Costs**

The capital cost consists of cost incurred during the construction period. Generally, this sort of road construction projects run across multiple financial years. The total expenditure to be incurred during the construction period is termed as capital cost.

The total cost includes the cost of construction of road and other structures and consultancy charges. In addition to this cost, it also includes the cost of construction of tollbooths.

Construction expenses can be broadly classified as follows:

- Preliminary and pre-operative expenses
- Land Acquisition
- Materials
- Labour
- Overheads incurred in the course of actual construction
- Contingency allowance
- Interest during construction period

**12.8.1.2 Operating and Maintenance Costs**

Routine maintenance cost would be incurred once the Toll road is operational. Routine maintenance involves Patching of potholes, sealing of cracks, Edge Repair, Surface Renewal, Periodic maintenance for new highways would be met with in accordance with the analysis of the life cycle model carried out for the project.

Annual operating cost includes the cost of operating tollbooths, administrative expenses, emergency services, communications and security services and other costs of operation.

Maintenance cost includes the cost of annual maintenance (routine) and periodic maintenance.

- Annual maintenance cost includes primary maintenance of wearing surface, railings, roadside furniture, etc.
12.26 COST AND MANAGEMENT ACCOUNTING

- Periodic maintenance cost includes the cost of overlays (wearing coats), painting of railings, etc.

Operating and Maintenance expenses can be broadly classified as follows:

- Toll collection expenses
- Administrative expenses for day-to-day operation.
- Maintenance expenses, which include routing and periodic maintenance.
- Interest expenses incurred for servicing term loans.

12.8.2 Build-Operate-Transfer (BOT) Approach

In recent years a growing trend emerged among Governments in many countries to solicit investments for public projects from the private sector under BOT scheme. BOT is an option for the Government to outsource public projects to the private sector.

With BOT, the private sector designs, finances, constructs and operate the facility and eventually, after specified concession period, the ownership is transferred to the Government. Therefore, BOT can be seen as a developing technique for infrastructure projects by making them amenable to private sector participation.

The fundamental principle in determining user levy is, ‘if the price for a transport facility is set at a level that reflects the benefit, each user gains from improvements in the facility, it will result in traffic flow levels that equate social costs with user benefits.’

12.8.3 Toll Rate

In general, the toll rate should have a direct relation with the benefits that the road users would gain from its improvements. The benefits to road users are likely to be in terms of fuel savings, improvement in travel time and Good riding quality.

To compute the toll rate following formula with rounding off to nearest multiple of five has been adopted:

User Fee = Total Distance × Toll Rate per km

ILLUSTRATION 10

BH G Toll Plaza Ltd built a 60 km. long highway and now operates a toll plaza to collect tolls from passing vehicles using the same. The company has invested ₹600 crore to build the road and has estimated that a total of 60 crore vehicles will be using the highway during the 10 years toll collection tenure. Toll Operating and Maintenance cost for the month of April 20X7 are as follows:

(i) Salary to –
   - Collection Personnel (3 Shifts and 4 persons per shift) - ₹150 per day per person
   - Supervisor (2 Shifts and 1 person per shift) - ₹250 per day per person
o Security Personnel (3 Shifts and 2 persons per shift) - ₹150 per day per person
o Toll Booth Manager (2 Shifts and 1 person per shift) - ₹400 per day per person

(ii) Electricity – ₹ 80,000
(iii) Telephone – ₹ 40,000
(iv) Maintenance cost – ₹ 30 Lacs
(v) The company needs 25% profit over total cost to cover interest and other costs.

Required:
(i) Calculate cost per kilometer.
(ii) Calculate the toll rate per vehicle (assume there is only one type of vehicle).

SOLUTION

Statement of cost

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Apportionment of capital cost</td>
<td>₹5,00,00,000</td>
</tr>
<tr>
<td>B. Operating Cost</td>
<td></td>
</tr>
<tr>
<td>Salary to Collection Personnel</td>
<td>₹54,000</td>
</tr>
<tr>
<td>Salary to Supervisor</td>
<td>₹15,000</td>
</tr>
<tr>
<td>Salary to Security Personnel</td>
<td>₹27,000</td>
</tr>
<tr>
<td>Salary to Toll Booth Manager</td>
<td>₹24,000</td>
</tr>
<tr>
<td>Electricity</td>
<td>₹80,000</td>
</tr>
<tr>
<td>Telephone</td>
<td>₹40,000</td>
</tr>
<tr>
<td>C. Maintenance cost</td>
<td>₹30,00,000</td>
</tr>
<tr>
<td>Total (A + B + C)</td>
<td>₹5,32,40,000</td>
</tr>
</tbody>
</table>

(i) Calculation of cost per kilometer:

\[
\text{Cost per kilometer} = \frac{\text{Total Cost}}{\text{Total km.}} = \frac{₹5,32,40,000}{60 \text{ km.}} = ₹8,87,333.33
\]
(ii) **Calculation of toll rate per vehicle:**

\[
\text{Rate per vehicle} = \frac{\text{Total Cost} + 25\% \text{ profit}}{\text{Vehicles per month}} = \frac{\text{\₹ 5,32,40,000} + \text{\₹ 1,33,10,000}}{\text{50,00,000 vehicles}} = \text{\₹ 13.31}
\]

**Working:**

No. of vehicles using the highway per month

\[
\text{Total estimated vehicles per month} \times \frac{1 \text{ month}}{10 \text{ years}} = \frac{60 \text{ crore}}{12 \text{ months}} = 50 \text{ lakhs}
\]
• Computer maintenance and internet charges,
• Building maintenance,
• Repairs and maintenance of equipment,
• Administrative expenses,
• Finance charges etc.

**Cost Centres and basis of cost allocation**

Cost centres in educational institutions are classified as follows:

- Primary or Direct cost centres (like Civil Engineering department, Mechanical Engineering department, etc.)
- Service cost centres (like Laboratory, Library, Sports, etc.)
- Student’s Self-Supporting Services (like Transport, Hostel & Mess, etc.)
- Administration Cost centres (like Research & Improvement, Examination)

Costs incurred are allocated to the respective cost centres, if they are identifiable with a cost centre and apportioned to service and administration cost centres on suitable basis.

**(ii) Research and Development Cost**

Educational institutions undertake academic research on various fields of specialisations. The costs of such research including personal costs, books etc. are to be collected through a cost centre approach. All costs incurred in that cost centre are collected and set off against the revenue generated from such research projects.

If any balance is left out as undistributed, then such balance costs can be collectively distributed to all other course cost centre as a separate cost element namely “Research costs”.

**(iii) Cost of Publication of research and other materials**

In an educational institution, there will be a separate department for conducting research publication related exercise. The cost incurred would be directly allocated to that department.

**12.10 COSTING FOR INSURANCE COMPANIES**

Insurance or assurance industry operates in providing social security to the persons who subscribe for the policy. The Insurance companies are broadly classified as Life insurer and Non-Life Insurer (General Insurance providers). Life insurers provide assurance to the policy holders’ life for the insured value. The Non-life insurers are providing insurance to the policy holder for actual loss upto insured value for the policy.
The insurance companies are required to analyse its various insurance product for profitability. The product offered by insurance companies may include:

(i) Life Insurance policies- with or without maturity benefits
(ii) General insurance- Health, Fire, Property, Travel Insurance etc.
(iii) Others services- Re-insurance, Fund management- Pension, Gratuity and other etc.

12.10.1 Income of Insurance companies

Income of insurance companies may include

(i) Premium on policy (periodic or one time)
(ii) Commission on re-insurance
(iii) Fund administration fee and return on investment of fundsetc.

12.10.2 Expenditure of Insurance companies

The Expenditure of an insurance company can be classified as direct and indirect to a policy or product.

Direct- Commission paid to agents, claim settlement, cost of valuation, premium for re-insurance, legal and other costs etc.

Indirect Cost- Actuarial fees, market and product development costs, administration cost, asset management cost etc.

12.10.3 Method of Costing in an Insurance Company

The cost object in an insurance company may be a product, a policy, a department or region, an agent etc.

Activity Based Costing in Insurance Companies

Activity based costing (ABC) is used for analysis of cost-benefit of a product (Direct Product Profitability), policy profitability (Customer Profitability Analysis) etc.

Costs that occur in insurance companies are to be identified with appropriate activities that have caused its occurrence. Then costs must be reassigned from activities to cost objects (insurance contracts and policies, customers, delivery channels) based on identified cost drivers.

Identification of activities and assignment of costs are the most critical for the implementation of activity based costing. The activities can be divided into two part i.e. (i) Pre-product development activities and (ii) Post product development activities.

(i) Pre-product development activities: These are the activities which are carried out before a product is made. It includes market research, product development like specification of coverage, conditions, amount of premium, insurance contract, policy forms and provision for sales channel etc.
(ii) Post product development activities: This activity is further divided into parts i.e. (a) Selling of policy and (b) Processing of claims. (a) Selling of policy refers to appointment of distribution of sales channel (direct selling or through agencies), soliciting for policy, processing of applications etc. (b) Processing of claim includes claim inception, claim estimation, claim settlement and legal actions.

The activity costs are assigned to the products on the basis of appropriate cost drivers. The cost drivers may include no. of hours spent on processing of an application and claim processing, no. of application, no. of policy, no. of claim etc.

12.11 COSTING FOR FINANCIAL INSTITUTIONS

In the past two decades, financial institutions have undergone major changes— in terms of increased regulations, competition from new entrants from both locally and globally, innovation of new products and services, technological advancement and increased expectations of new generation customers, etc.

Over and above the challenges posed by the prevailing environment as described above, financial institutions underwent considerable changes in terms of its high quality, sensitive staffing requirements and its productivity.

Manpower cost, other than interest cost and finance charges, is one of the largest single cost components in financial institutions. Hence, it is needless to say, that financial institutions are more interested in understanding and discovering the ways to more accurately allocate such costs to various product ranges offered by them and its customers.

If the financial institution has to survive under the present challenging economic conditions, it will have to add value to its products and services. It is imperative to note that the financial institution needs to know the contribution of its products, services and customers to value creation.

12.11.1 Cost measurement in financial institutions

The objectives of cost measurement includes –

- Understand the profitability by products offered and by customers
- Establishing a mechanism for pricing the products, by identifying the product level and activity level unit costs
- Understanding productivity issues and their relationship with strategic goals of the organization

In nutshell, financial institutions need to understand their position in various product lines and to find out how they can stay in competing edge or becomes a leader.

12.11.2 Activity Based Costing in Financial Institutions

Activity based costing can be a useful tool in allocating the cost elements to
various products offered and the customers being served.
Activity based costing can help financial institutions to –

• Identify and analyze the profitability by product
• Analyze the profitability by customer
• Identify the activity level unit costs and build up product level costs, which in turn forms basis for product level pricing / customer level pricing

Financial institutions can improve their profitability by –

• Concentrating on products that are more profitable
• Focus on high margin customers

Costs that occur in financial institutions are to be identified with appropriate activities that have caused its occurrence. Then costs must be reassigned from activities to cost objects (various loan products offered by the organization, customers, etc.) based on identified cost drivers.

The concepts on activity based costing as discussed under Costing of Insurance Companies also applicable to financial institutions. Please refer the same.

ILLUSTRATION 11

The loan department of a bank performs several functions in addition to home loan application processing task. It is estimated that 25% of the overhead costs of loan department are applicable to the processing of home-loan application. The following information is given concerning the processing of a loan application:

Direct professional labor:

<table>
<thead>
<tr>
<th>Description</th>
<th>₹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loan processor monthly salary:</td>
<td>80,000</td>
</tr>
<tr>
<td>(4 employees @ ₹ 20,000 each)</td>
<td></td>
</tr>
<tr>
<td>Loan department overhead costs (monthly)</td>
<td></td>
</tr>
<tr>
<td>Chief loan officer’s salary</td>
<td>5,000</td>
</tr>
<tr>
<td>Telephone expenses</td>
<td>750</td>
</tr>
<tr>
<td>Depreciation Building</td>
<td>2,800</td>
</tr>
<tr>
<td>Legal advice</td>
<td>2,400</td>
</tr>
<tr>
<td>Advertising</td>
<td>400</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>650</td>
</tr>
<tr>
<td>Total overhead costs</td>
<td>12,000</td>
</tr>
</tbody>
</table>

You are required to compute the cost of processing home loan application on the assumption that one hundred home loan applications are processed each month.

SOLUTION

Statement showing computation of the cost of processing
## 12.12 OTHER SERVICES-COSTING FOR POWER HOUSES

Power houses are engaged either in electricity generation or steam generation. It uses the concepts of service costing i.e. ‘Power House Costing.’ Service cost statement can be prepared by identifying the costs associated with the power generation or steam generation.

Cost unit is different for electricity generation and steam generation.

The cost unit for electricity generation organization is cost per kilowatt-hour (kWh) – that means cost of generating one kilowatt of power per hour. Please note that kWh is commonly known as a “Unit”.

The costs are shown under the following heads:

(i) **Standing Charges or Fixed costs:** These are the fixed costs that remain constant irrespective of the power or stream generated. These costs include the following:
   - Rent, Rates & Taxes
   - Insurance
   - Depreciation
   - Salaries, if paid on Time (Monthly) basis
   - Administration expenses, etc.

(ii) **Variable costs or Running costs:** These costs are generally associated with the power or stream generated. These costs include the following:
   - Fuel Charges
   - Water Charges
   - Wages / Labour charges, if paid on the basis of production
   - Any other variable costs identified.

(iii) **Semi-variable costs or Maintenance costs:** These costs include the following:
   - Meters
From the following data pertaining to the year 20X7-X8 prepare a cost statement showing the cost of electricity generated per kWh by Chambal Thermal Power Station.

Total units generated 10,00,000 kWh

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating labour</td>
<td>15,00,000</td>
</tr>
<tr>
<td>Repairs &amp; maintenance</td>
<td>5,00,000</td>
</tr>
<tr>
<td>Lubricants, spares and stores</td>
<td>4,00,000</td>
</tr>
<tr>
<td>Plant supervision</td>
<td>3,00,000</td>
</tr>
<tr>
<td>Administration overheads</td>
<td>20,00,000</td>
</tr>
</tbody>
</table>

5 kWh. of electricity generated per kg of coal consumed @ ₹4.25 per kg. Depreciation charges @ 5% on capital cost of ₹2,00,00,000.

**SOLUTION**

Cost Statement of Chambal Thermal Power Station

<table>
<thead>
<tr>
<th>Description</th>
<th>Per annum (₹)</th>
<th>Per kWh (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fixed costs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant supervision</td>
<td>3,00,000</td>
<td></td>
</tr>
<tr>
<td>Administration overheads</td>
<td>20,00,000</td>
<td></td>
</tr>
<tr>
<td>Depreciation (5% of ₹2,00,00,000 p.a.)</td>
<td>10,00,000</td>
<td></td>
</tr>
<tr>
<td>Total fixed cost: (A)</td>
<td>33,00,000</td>
<td>3.30</td>
</tr>
<tr>
<td><strong>Variable costs:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating labour</td>
<td>15,00,000</td>
<td></td>
</tr>
<tr>
<td>Lubricants, spares and stores</td>
<td>4,00,000</td>
<td></td>
</tr>
<tr>
<td>Repairs &amp; maintenance</td>
<td>5,00,000</td>
<td></td>
</tr>
<tr>
<td>Coal cost (Refer to working note)</td>
<td>8,50,000</td>
<td></td>
</tr>
<tr>
<td>Total variable cost: (B)</td>
<td>32,50,000</td>
<td>3.25</td>
</tr>
<tr>
<td>Total cost [(A) + (B)]</td>
<td>65,50,000</td>
<td>6.55</td>
</tr>
</tbody>
</table>

**Working Note:**

Coal cost (10,00,000 kwh. ÷ 5 kwh) × ₹4.25 per kg. = ₹8,50,000
SUMMARY

- **Service Costing:** It is application of cost concepts in ascertaining the cost or providing services. It is also known as operating costing as relates to operating of a service.

- **Composite Cost Unit:** Unit of service cost consists of two different units.

- **Equivalent Service Unit:** To calculate cost or pricing of two or more different grade of services which uses common resources, each grade of service is assigned a weight and converted into equivalent units. Converting services into equivalent units make different grade of services equivalent and comparable.

- **Build-Operate-Transfer (BOT):** With BOT, the private sector designs, finances, constructs and operate the facility and eventually, after specified concession period, the ownership is transferred to the Government. Therefore, BOT can be seen as a developing technique for infrastructure projects by making them amenable to private sector participation.

---

**TEST YOUR KNOWLEDGE**

MCQs based Questions

1. Composite cost unit for a hospital is:
   (a) Per patient
   (b) Per patient-day
   (c) Per day
   (d) Per bed

2. Cost of diesel and lubricant is an example of:
   (a) Operating cost
   (b) Fixed charges
   (c) Semi-variable cost
   (d) None of the above

3. Cost units used in power sector is:
   (a) Kilo meter (K.M)
   (b) Kilowatt-hour (kWh)
   (c) Number of electric points
   (d) Number of hours

4. Absolute Tonne-km. is an example of:
   (a) Composite units in power sector
   (b) Composite unit of transport sector
   (c) Composite unit for bus operation
   (d) Composite unit for oil and natural gas
5. Depreciation is treated as fixed cost if it is related to:
   (a) Activity level
   (b) Related with machine hours
   (c) Efflux of time
   (d) None of the above

6. Jobs undertaken by IT & ITES organizations are considered as:
   (a) Project
   (b) Batch work
   (c) Contract
   (d) All the above

7. In Toll Road costing, the repetitive costs includes:
   (a) Maintenance cost
   (b) Annual operating costs
   (c) None of the above
   (d) Both (a) and (b)

8. BOT approach means:
   (a) Build, Operate and Transfer
   (b) Buy, Operate and Transfer
   (c) Build, Operate and Trash
   (d) Build, Own and Trash

9. Pre-product development activities in an insurance companies, include:
   (a) Processing of Claim
   (b) Selling of policy
   (c) Provision of conditions
   (d) Policy application processing

10. Which of the following costing method is not appropriate for costing of educational institutes:
    (a) Batch Costing
    (b) Activity Based Costing
    (c) Absorption Costing
    (d) Process Costing

**Theoretical Questions**

1. Explain briefly, what do you understand by Service Costing.
2. How are composite units is computed?
3. What are the features of service costing?
Practical Questions

1. Mr. X owns a bus which runs according to the following schedule:

   (i) Delhi to Chandigarh and back, the same day.
   - Distance covered: 250 km. one way.
   - Number of days run each month: 8
   - Seating capacity occupied: 90%.

   (ii) Delhi to Agra and back, the same day.
   - Distance covered: 210 km. one way
   - Number of days run each month: 10
   - Seating capacity occupied: 85%

   (iii) Delhi to Jaipur and back, the same day.
   - Distance covered: 270 km. one way
   - Number of days run each month: 6
   - Seating capacity occupied: 100%

   (iv) Following are the other details:
   - Cost of the bus: ₹ 12,00,000
   - Salary of the Driver: ₹ 24,000 p.m.
   - Salary of the Conductor: ₹ 21,000 p.m.
   - Salary of the part-time Accountant: ₹ 5,000 p.m.
   - Insurance of the bus: ₹ 4,800 p.a.
   - Diesel consumption 4 km. per litre at: ₹ 56 per litre
   - Road tax: ₹ 15,915 p.a.
   - Lubricant oil: ₹ 10 per 100 km.
   - Permit fee: ₹ 315 p.m.
   - Repairs and maintenance: ₹ 1,000 p.m.
   - Depreciation of the bus @ 20% p.a.
   - Seating capacity of the bus: 50 persons.

   Passenger tax is 20% of the total takings. Calculate the bus fare to be charged from each passenger to earn a profit of 30% on total takings. The fares are to be indicated per passenger for the journeys:

   (i) Delhi to Chandigarh
   (ii) Delhi to Agra
   (iii) Delhi to Jaipur.

2. A company is considering three alternative proposals for conveyance facilities for its sales personnel who has to do considerable traveling, approximately 20,000 kilometres every year. The proposals are as follows:
(i) Purchase and maintain its own fleet of cars. The average cost of a car is ₹ 6,00,000.

(ii) Allow the Executive use his own car and reimburse expenses at the rate of ₹ 10 per kilometer and also bear insurance costs.

(iii) Hire cars from an agency at ₹ 1,80,000 per year per car. The company will have to bear costs of petrol, taxes and tyres.

The following further details are available:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol</td>
<td>₹ 6 per km.</td>
</tr>
<tr>
<td>Tyre</td>
<td>₹ 0.12 per km.</td>
</tr>
<tr>
<td>Taxes</td>
<td>₹ 800 per car per annum</td>
</tr>
<tr>
<td>Repairs and maintenance</td>
<td>₹ 0.20 per km.</td>
</tr>
<tr>
<td>Insurance</td>
<td>₹ 1,200 per car per annum</td>
</tr>
<tr>
<td>Life of the car</td>
<td>5 years with annual mileage</td>
</tr>
<tr>
<td></td>
<td>of 20,000 km.</td>
</tr>
</tbody>
</table>

Resale value: ₹ 80,000 at the end of the fifth year.

Work out the relative costs of three proposals and rank them.

3. From the following data pertaining to the year 20X7-X8 prepare a cost statement showing the cost of electricity generated per kwh by Chambal Thermal Power Station.

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total units generated</td>
<td>10,00,000 kWh</td>
</tr>
<tr>
<td>Operating labour</td>
<td>₹ 15,00,000</td>
</tr>
<tr>
<td>Repairs &amp; maintenance</td>
<td>₹ 5,00,000</td>
</tr>
<tr>
<td>Lubricants, spares and stores</td>
<td>₹ 4,00,000</td>
</tr>
<tr>
<td>Plant supervision</td>
<td>₹ 3,00,000</td>
</tr>
<tr>
<td>Administration overheads</td>
<td>₹ 20,00,000</td>
</tr>
</tbody>
</table>

5 kWh. of electricity generated per kg. of coal consumed @ ₹ 4.25 per kg. Depreciation charges @ 5% on capital cost of ₹ 2,00,00,000.

**ANSWERS/ SOLUTIONS**

**Answers to the MCQs**

1. (b) 2. (a) 3. (b) 4. (b) 5. (c) 6. (a) 7. (a) 8. (a) 9. (c) 10. (d)

**Answers to the Theoretical Questions**

1. Please refer paragraph 12.1
2. Please refer paragraph 12.2
3. Please refer paragraph 12.1
Answer to the Practical Questions

1. Working Notes:

Total Distance (in km.) covered per month

<table>
<thead>
<tr>
<th>Bus route</th>
<th>Km. per trip</th>
<th>Trips per day</th>
<th>Days per month</th>
<th>Km. per month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi to Chandigarh</td>
<td>250</td>
<td>2</td>
<td>8</td>
<td>4,000</td>
</tr>
<tr>
<td>Delhi to Agra</td>
<td>210</td>
<td>2</td>
<td>10</td>
<td>4,200</td>
</tr>
<tr>
<td>Delhi to Jaipur</td>
<td>270</td>
<td>2</td>
<td>6</td>
<td>3,240</td>
</tr>
</tbody>
</table>

Passenger-km. per month

<table>
<thead>
<tr>
<th>Bus route</th>
<th>Total seats available per month (at 100% capacity)</th>
<th>Capacity utilised</th>
<th>Km. per trip</th>
<th>Passenger-km. per month</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(%) Seats</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delhi to Chandigarh &amp; Back</td>
<td>800 (50 seats × 2 trips × 8 days)</td>
<td>90</td>
<td>250</td>
<td>1,80,000 (720 seats × 250 km.)</td>
</tr>
<tr>
<td>Delhi to Agra &amp; Back</td>
<td>1,000 (50 seats × 2 trips × 10 days)</td>
<td>85</td>
<td>210</td>
<td>1,78,500 (850 seats × 210 km.)</td>
</tr>
<tr>
<td>Delhi to Jaipur &amp; Back</td>
<td>600 (50 seats × 2 trips × 6 days)</td>
<td>100</td>
<td>270</td>
<td>1,62,000 (600 seats × 270 km.)</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>5,20,500</td>
</tr>
</tbody>
</table>

Monthly Operating Cost Statement

<table>
<thead>
<tr>
<th></th>
<th>(₹)</th>
<th>(₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(i) Running Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Diesel {(11,440 km ÷ 4 km) × ₹ 56}</td>
<td>1,60,160</td>
<td></td>
</tr>
<tr>
<td>- Lubricant oil {(11,440 km ÷ 100) × ₹ 10}</td>
<td>1,144</td>
<td>1,61,304</td>
</tr>
<tr>
<td>(ii) Maintenance Costs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Repairs &amp; Maintenance</td>
<td></td>
<td>1,000</td>
</tr>
<tr>
<td>(iii) Standing charges</td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Salary to driver</td>
<td></td>
<td>24,000</td>
</tr>
</tbody>
</table>
- Salary to conductor  
  21,000
- Salary of part-time accountant  
  5,000
- Insurance (₹ 4,800 ÷ 12)  
  400
- Road tax (₹ 15,915 ÷ 12)  
  1,326.25
- Permit fee  
  315
- Depreciation {(₹ 12,00,000 × 20%) ÷ 12}  
  20,000

Total costs per month before Passenger Tax (i)+(ii)+(iii)  
2,34,345.25

Passenger Tax*  
93,738.10

Total Cost  
3,28,083.35

Add: Profit*  
1,40,607.15

Total takings per month  
4,68,690.50

*Let, total takings be X then

X = Total costs per month before passenger tax + 0.2 X (passenger tax) + 0.3 X (profit)

X = ₹ 2,34,345.25 + 0.2 X + 0.3 X

0.5 X = ₹ 2,34,345.25  
or,  
X = ₹ 4,68,690.50

Passenger Tax = 20% of ₹ 4,68,690.50 = ₹ 93,738.10

Profit = 30% of ₹ 4,68,690.50 = ₹ 1,40,607.15

Calculation of Rate per passenger km. and fares to be charged for different routes

Rate per Passenger-Km. = \[
\frac{\text{Total takings per month}}{\text{Total Passenger-Km. per month}}
\]

= \[
\frac{₹ 4,68,690.50}{5,20,500 \text{ Passenger -Km.}}
\] = ₹ 0.90

Bus fare to be charged per passenger.

Delhi to Chandigarh = ₹ 0.90 × 250 km = ₹ 225.00
Delhi to Agra = ₹ 0.90 × 210 km = ₹ 189.00
Delhi to Jaipur = ₹ 0.90 × 270 km = ₹ 243.00
2. Calculation of relative costs of three proposals and their ranking

<table>
<thead>
<tr>
<th></th>
<th>I Use of company’s car per km. (₹)</th>
<th>II Use of own car per km. (₹)</th>
<th>III Use of hired car per km. (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reimbursement</td>
<td>--</td>
<td>10.00</td>
<td>9.00*</td>
</tr>
<tr>
<td>Fixed cost:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td>1,200</td>
<td>0.06</td>
<td>--</td>
</tr>
<tr>
<td>Taxes</td>
<td>800</td>
<td>0.04</td>
<td>--</td>
</tr>
<tr>
<td>Depreciation</td>
<td>1,04,000</td>
<td>5.20</td>
<td>--</td>
</tr>
<tr>
<td>(₹ 6,00,000 - ₹80,000) ÷ 5 year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Running and Maintenance Cost:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Petrol</td>
<td>--</td>
<td>6.00</td>
<td>--</td>
</tr>
<tr>
<td>Repairs and Maintenance</td>
<td></td>
<td>0.20</td>
<td>--</td>
</tr>
<tr>
<td>Tyre</td>
<td>--</td>
<td>0.12</td>
<td>--</td>
</tr>
<tr>
<td>Total cost per km.</td>
<td>--</td>
<td>11.62</td>
<td>10.06</td>
</tr>
<tr>
<td>Cost for 20,000 km.</td>
<td></td>
<td>2,32,400</td>
<td>2,01,200</td>
</tr>
<tr>
<td>Ranking of proposals</td>
<td></td>
<td>II</td>
<td>I</td>
</tr>
</tbody>
</table>

* (₹ 1,80,000 ÷ 20,000 km.)

The Second alternative i.e., use of own car by the executive and reimbursement of expenses by the company is the best alternative from company’s point of view.

3. Cost Statement of Chambal Thermal Power Station

Total units generated 10,00,000 kWh.

<table>
<thead>
<tr>
<th>Fixed costs:</th>
<th>Per annum (₹)</th>
<th>Per kWh. (₹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant supervision</td>
<td>3,00,000</td>
<td></td>
</tr>
<tr>
<td>Administration overheads</td>
<td>20,00,000</td>
<td></td>
</tr>
<tr>
<td>Depreciation (5% of ₹ 2,00,00,000 p.a.)</td>
<td>10,00,000</td>
<td></td>
</tr>
<tr>
<td>Total fixed cost: (A)</td>
<td>33,00,000</td>
<td>3.30</td>
</tr>
</tbody>
</table>
### Variable costs:

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating labour</td>
<td>15,00,000</td>
</tr>
<tr>
<td>Lubricants, spares and stores</td>
<td>4,00,000</td>
</tr>
<tr>
<td>Repairs &amp; maintenance</td>
<td>5,00,000</td>
</tr>
<tr>
<td>Coal cost (Refer to working note)</td>
<td>8,50,000</td>
</tr>
<tr>
<td><strong>Total variable cost: (B)</strong></td>
<td>32,50,000</td>
</tr>
</tbody>
</table>

**Total cost [(A) + (B)]**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total cost</strong></td>
<td>65,50,000</td>
</tr>
</tbody>
</table>

### Working Note:

Coal cost (10,00,000 kWh. ÷ 5 kWh) × ₹ 4.25 per kg. = ₹ 8,50,000