

PAPER – 5: ADVANCED MANAGEMENT ACCOUNTING
QUESTIONS

Total Quality Management

1. KNM Road Carriers is a transporting company that transports goods from one place to another. It measures quality of service in terms of:

- (i) Time required to transport goods
- (ii) On-time delivery
- (iii) Number of lost or damaged cartons.

To improve its business prospects and performance the company is seriously considering to install a scheduling and tracking system, which involves an annual outlay of ₹1,25,000. The company furnishes the following information about its present and anticipated future performance:

	Current	Expected
On-time delivery	85%	95%
Variable costs per carton lost or damaged	₹ 55	₹ 55
Fixed costs per carton lost or damaged	₹ 45	₹ 45
Number of cartons lost or damaged	2,500	1,200

The company expects that each half per cent point increase in on-time performance will result in revenue increase of ₹9,000 per annum. Contribution margin of 45% is required.

Required

- (i) Should KNM Road Carriers acquire and install the new system?
- (ii) Also calculate additional amount of revenue required if benefits from new system is equal to cost & Contribution margin is 47.5%.

Kaizen Costing System

2. FZ India Ltd. (FZIL) is an automobile manufacturer in India and a subsidiary of Japanese automobile and motorcycle manufacturer Fuji. It manufactures and sells a complete range of cars from the entry level to the hatchback to sedans and has a present market share of 27% of the Indian passenger car markets. FZIL uses a system of standard costing to set its budgets. Budgets are set semi-annually by the Finance department after the approval of the Board of Directors at FZIL. The Finance department prepares variance reports each month for review in the Board of Directors meeting, where actual performance is compared with the budgeted figures. Ms. Kiyoshi, group CEO of the Fuji is of the opinion that Kaizen costing method should be implemented as a system of planning and control in the FZIL.

Required

Recommend key changes vital to FZIL's planning and control system to support the adoption of Kaizen Costing Concepts.

Activity Based Costing

3. A manufacturing company produces Ball Pens that are printed with the logos of various companies. Each Pen is priced at ₹5. Costs are as follows:

Cost Driver	Unit Variable Cost (₹)	Level of Cost Driver
Units Sold	2.5	-
Setups	225	40
Engineering hours	10	250

Other Data

Total Fixed Costs (conventional)	₹ 48,000
Total Fixed Costs (ABC)	₹ 36,500

Required

- Compute the break-even point in units using activity-based analysis.
- Suppose that company could reduce the setup cost by ₹ 75 per setup and could reduce the number of engineering hours needed to 215. How many units must be sold to break even in this case?

Just in Time

4. Haigh Ltd. is a leading manufacturing company. Under increasing pressure to reduce costs, to contain inventory and to improve service, Haigh's Costing Department has recently undertaken a decision to *implement a JIT System*.

The management of Haigh is convinced of the benefits of their changes. But Supplies Manager Mr. Smith fears with the Costing Department's decision. He said:

"We've been driven by suppliers for years ... they would insist that we could only purchase in thousands, that we would have to wait weeks, or that they would only deliver on Mondays!"

Required

Is Mr. Smith's view point correct and why?

Limiting Factor

5. List out the basis for deciding the priority of selecting the best product in the different circumstances stated below:
- When maximum sales (in value) is a limiting factor.
 - When raw-material is a limiting factor.

- (iii) When labour hour is a limiting factor.
 (iv) When there is a heavy demand for the product.

Break-even Point (Batches)

6. DRB Ltd. is a leading Home Appliances manufacturer. The company uses just-in-time manufacturing process, thereby having no inventory. Manufacturing is done in batch size of 100 units which cannot be altered without significant cost implications. Although the products are manufactured in batches of 100 units, they are sold as single units at the market price. Due to fierce competition in the market, the company is forced to follow market price of each product. The following table provides the financial results of its four unique products:

	D ₁	D ₂	D ₃	D ₄	Total
Sales (units)	2,00,000	2,60,000	1,60,000	3,00,000	
	(₹)	(₹)	(₹)	(₹)	(₹)
Revenue	26,00,000	45,20,000	42,40,000	32,00,000	145,60,000
Less: Material Cost	6,00,000	18,20,000	18,80,000	10,00,000	53,00,000
Less: Labour Cost	8,00,000	20,80,000	12,80,000	12,00,000	53,60,000
Less: Overheads	8,00,000	7,80,000	3,20,000	12,00,000	31,00,000
Profit / (Loss)	4,00,000	(1,60,000)	7,60,000	(2,00,000)	8,00,000

Since, company is concerned about loss in manufacturing and selling of two products so, it has approached you to clear picture on its products and costs. You have conducted a detailed investigation whose findings are below:

The overhead absorption rate of ₹2 per machine hour has been used to allocate overheads into the above product costs. Further analysis of the overhead cost shows that some of it is caused by the number of machine hours used, some is caused by the number of batches produced and some are product specific fixed overheads that would be avoided if the product were discontinued. Other general fixed overhead costs would be avoided only by the closure of the factory. Numeric details are summarized below:

	₹	₹
Machine hour related		6,20,000
Batch related		4,60,000
Product specific fixed overhead:		
D ₁	10,00,000	
D ₂	1,00,000	
D ₃	2,00,000	
D ₄	<u>1,00,000</u>	14,00,000
General fixed overheads		<u>6,20,000</u>
		<u>31,00,000</u>

The other information is as follows:-

	D ₁	D ₂	D ₃	D ₄	Total
Machine Hours	4,00,000	3,90,000	1,60,000	6,00,000	15,50,000
Labour Hours	1,00,000	2,60,000	1,60,000	1,50,000	6,70,000

Required

- Prepare a profitability statement that is more useful for decision making than the profit statement prepared by DRB Ltd.
- Calculate the break-even volume in batches and also in approximate units for Product 'D₁'.

Flexible Budget

7. WDG Ltd. Had prepared fixed and flexible budget for the financial year 2015-16 as under:

	Fixed Budget for full capacity (₹)	Flexible Budget for 75% level (₹)
Sales	13,50,000	10,12,500
Direct Material	4,25,000	3,18,750
Direct Labour	1,85,000	1,38,750
Variable Overheads	2,15,000	1,61,250
Semi-Variable Overheads	3,65,000	3,23,750
Profit	1,60,000	70,000

After the closing of the financial year 2015-16, total actual sales stood at ₹11,07,000 and there was a favourable sales price variance of ₹17,000 (F).

Required

Prepare a flexible budget for the actual level of sales.

Pareto Analysis

8. Nine Plus Technology Ltd. develops cutting-edge innovations that are powering the next revolution in mobility and has nine tablet smart phone models currently in the market whose previous year financial data is given below:

Model	Sales (₹'000)	Profit-Volume (PV) Ratio
Tab - A001	5,100	3.53%
Tab - B002	3,000	23.00%
Tab - C003	2,100	14.29%
Tab - D004	1,800	14.17%
Tab - E005	1,050	41.43%

Tab - F006	750	26.00%
Tab - G007	450	26.67%
Tab - H008	225	6.67%
Tab - I009	75	60.00%

Required

Using the financial data, carry out a Pareto analysis (80/20 rule) of Sales and Contribution. Discuss your findings with appropriate recommendations.

Standard Costing

9. Sapporo Manufacturing Co. (SMC) is a leading consumer goods company. The budgeted and actual data of SMC for the year 2014-15 are as follows:-

Particulars	Budget	Actual	Variance
Sales / Production (units)	2,00,000	1,65,000	(35,000)
Sales (₹)	21,00,000	16,92,900	(4,07,100)
Less: Variable Costs (₹)	12,66,000	10,74,150	1,91,850
Less: Fixed Costs (₹)	3,15,000	3,30,000	(15,000)
Profit	5,19,000	2,88,750	(2,30,250)

The budgeted data shown in the table is based on the assumption that total market size would be 4,00,000 units but it turned out to be 3,75,000 units.

Required

Prepare a statement showing reconciliation of budget profit to actual profit through marginal costing approach for the year 2014-15 in as much detail as possible.

Decision Making

10. South Roadways Services Pvt. Ltd. is planning to run a fleet of 15 buses in Chittoor District on a fixed route. Company has estimated a total of 2,51,85,000 passenger kilometers per annum. It is estimated buses to have 100% load factor. Buses are purchased at a price of ₹ 44,00,000 per unit whose scrape value at the end of 5 years life is ₹ 5,50,000. Seating capacity of a bus excluding a Driver's seat is 42. Each bus can give a mileage of 5 kmpl. Average cost of fuel is ₹ 66 per liter. Cost of Lubricants & Sundries per 1,000 km would be ₹ 3,300. Company will pay ₹ 27,500 per month to Driver and two attendants for each bus.

Other annual charges per bus: Insurance ₹ 55,000, Garage Charges ₹ 33,000, Repairs & Maintenance ₹ 55,000. Route Permit Charges upto 20,000 km is ₹ 5,500 and ₹ 2,200 for every additional 5,000 km or part thereof.

Required

- (i) Calculate a suggested fare per passenger/km taking into account markup on cost @ 20% to cover general overheads and sufficient profit.
- (ii) The Transport Sector of Chittoor is highly regulated. The Government has fixed the fare @ ₹ 1.35 for next 2 years. Comment on the two year's profitability taking into consideration the inflation rate of 8%.

Note: Route permit charges is not subject to Inflation.

Transfer Pricing

11. AWB Ltd. has two divisions Division W and Division B. Division W produces product Z, which it sells to external market and also to Division B. Divisions in the AWB Ltd. are treated as profit centres and divisions are given autonomy to set transfer prices and to choose their supplier. Performance of each division measured on the basis of target profit given for each period.

Division W can produce 1,00,000 units of product Z at full capacity. Demand for product Z in the external market is for 70,000 units only at selling price of ₹ 2,500 per unit. To produce product Z Division W incurs ₹ 1,600 as variable cost per unit and total fixed overhead of ₹ 4,00,00,000. Division W has employed ₹ 12,00,00,000 as working capital, working capital is financed by cash credit facility provided by its lender bank @ 11.50% p.a. Division W has been given a profit target of ₹ 2,50,00,000 for the year.

Division B has found two other suppliers C Ltd and H Ltd. who are agreed to supply product Z.

Division B has requested a quotation for 40,000 units of product Z from Division W.

Required

- (i) Calculate the transfer price per unit of product Z that Division W should quote in order to meet target profit for the year.
- (ii) Calculate the two prices Division W would have to quote to Division B, if it became AWB Ltd. policy to quote transfer prices based on opportunity costs.

Linear Programming

12. The manufacturing company has 100 kg of A, 180 kg of B and 120 kg of C ingredients available per month. Company can use these materials to make three basic products namely 5-10-5, 5-5-10 and 20-5-10, where the numbers in each case represent the percentage of weight of A, B and C respectively in each of products. The cost of these raw materials are as follows:

Ingredient	Cost per Kg. (₹)
A	64
B	16
C	40
Inert Ingredients	16

Selling price of these products are ₹ 32.60, ₹ 34.80, and ₹ 36.00 per Kg, respectively. There is capacity restriction of the company product 5-10-5, so that company cannot produce more than 30 Kg per month.

Required

Formulate this problem as an LP model to determine the productions (in Kg.) of each product which will maximise its monthly profit.

Note: Formulate Only

Transportation Problem

13. Coupers Partners a leading CA firm has three managers. Each manager can work up to 176 hours during the next month, during which time three assignments must be completed. Tax Accounting (TA) Assignment will take 143 hours, Tax Performance Advisory (TPA) will take 154 hours, and Global Compliance & Reporting (GCR) will take 176 hours. The amount per hour that can be billed for assigning each manager to each assignment is given below:

Manager	Assignment		
	TA (₹)	TPA (₹)	GCR (₹)
C ₁	1,800	2,250	2,850
C ₂	2,100	1,950	1,800
C ₃	2,400	2,100	2,250

Required

Formulate this as a transportation problem and find the optimal solution. Also find out the maximum total billings during the next month.

Note: A manager may be involved in more than one assignment.

PERT and CPM

14. State the Validity of following statements along with the reasons:
- Two activities have common predecessor and successor activities. So, they can have common initial and final nodes.
 - In respect of any activity whether real or dummy, the terminal node should bear a number higher than the initial node number.
 - The difference between the latest event time and the earliest event time is termed as free float.
 - For every critical activity in a network, the earliest start and the earliest finish time as well as the latest finish time and the latest start time are the same.
 - The optimal duration of a project is the minimum time in which it can be completed.

- (vi) Resource leveling aims at smoothening of the resource usage rate without changing the project duration.

Simulation

15. Finance Controller of Dunk Limited has drawn the following projections with probability distribution:

Raw Material		Wages & Other Variable Overheads		Sales	
₹ in 000	Probability	₹ in 000	Probability	₹ in 000	Probability
08 – 10	0.2	11 – 13	0.3	34 – 38	0.1
10 – 12	0.3	13 – 15	0.5	38 – 42	0.3
12 – 14	0.3	15 – 17	0.2	42 – 46	0.4
14 – 16	0.2			46 – 50	0.2

Opening cash balance is ₹ 40,000 and fixed cost is estimated at ₹ 15,000 per month.

Required

Simulate cash flow projection and expected cash balance at the end of the sixth month. Use the following single digit random numbers.

Raw Material	4 3 1 0 4 6
Wages & Other Variable Overheads	2 7 9 1 8 9
Sales	0 6 6 0 2 8

Learning Curve

16. Marketing manager of AV Ltd. has conducted a market research on the price-demand relationship for its consumer durable product 'K-2'. K-2 is a recently launched product. The price-demand pattern will be as follows:

Price per unit (₹)	Demand (units)
11,100	1,000
10,700	2,000
9,600	3,000
8,700	4,000

K-2 is produced in batches of 1,000 units. Production manager of AV Ltd. has also researched and studied the production pattern and has believe that 50% of the variable manufacturing cost would have learning and experience curve effect. This learning & experience curve effect will be continued upto 4,000 units of production at a constant rate. But after 4,000 units of production, unit variable manufacturing cost would be equal to the unit cost at the 4th batch. The manufacturing unit cost of the first batch will be

₹ 4,400 of which only 50% is subjected to learning and experience curve effect. The average unit variable cost of all 4 batches will be ₹4,120.

Required

- (i) Calculate the rate of learning that has been expected by the Production manager.
- (ii) Calculate the price at which AV Ltd. should sell the K-2 in order to maximise its contribution.

Note

$\log 0.93 = -0.0315, \log 2 = 0.3010, 2^{-0.1047} = 0.9299, 3^{-0.1047} = 0.8913, 4^{-0.1047} = 0.8649$

SUGGESTED ANSWERS/ HINTS

1. (i) Should KNM Road Carriers acquire and install the new system?

		₹
Additional Costs of the new scheduling & tracking system p.a.		1,25,000
Additional Revenue from improvement in on-time performance (₹ 9,000 × 10%/0.5%)		1,80,000
Contribution from Additional Annual Revenue (45% × ₹ 1,80,000) (A)		81,000
Cost Saving in respect of Cartons [(2,500-1,200) × ₹ 55] ... (B)		71,500
Total Benefits ... (A+B)		1,52,500

As Expected Benefits are more than the cost. Accordingly company should install the new system.

Calculation of additional amount of revenue required if benefits from new system is equal to cost & Contribution margin is 47.5%:

		₹
Costs of the new scheduling & tracking system ... (A)		1,25,000
Cost Saving in respect of Cartons ... (B)		71,500
Contribution Margin ... (A – B)		53,500
Contribution Margin%		47.5
Corresponding Additional Revenue		1,12,632

2. **Kaizen Costing** emphasizes on *small but continuous improvement*. Targets once set at the beginning of the year or activities are *updated continuously* to reflect the improvement that has already been achieved and that are yet to be achieved.

The suggestive changes which are required to be adopted Kaizen Costing concepts in FZIL are as follows:

Standard Cost Control System to Cost Reduction System: Traditionally Standard Costing system assumes stability in the current manufacturing process and standards are set keeping the normal manufacturing process into account thus the whole effort is on to meet performance cost standard. On the other hand Kaizen Costing believes in continuous improvements in manufacturing processes and hence, the goal is to achieve cost reduction target. The first change required is the standard setting methodology i.e. from earlier Cost Control System to Cost Reduction System.

Reduction in the periodicity of setting Standards and Variance Analysis: Under the existing planning and control system followed by the FZIL, standards are set semi-annually and based on these standards monthly variance reports are generated for analysis. But under Kaizen Costing system cost reduction targets are set for small periods say for a week or a month. So the period covered under a standard should be reduced from semi-annually to monthly and the current practice of generating variance reports may be continued or may be reduced to a week.

Participation of Executives or Workers in standard setting: Under the Kaizen Costing system participation of workers or executives who are actually involved in the manufacturing process are highly appreciated while setting standards. So the current system of setting budgets and standards by the Finance department with the mere consent of Board of Directors required to be changed.

3. Break Even Units

$$1. \frac{[\text{Fixed Costs} + (\text{Setup Cost} \times \text{Setups}) + (\text{Engineering Cost} \times \text{Engineering Hours})]}{(\text{Sale Price} - \text{Variable Cost})}$$

$$= \frac{[36,500 + (\text{₹ } 225 \times 40) + (\text{₹ } 10 \times 250)]}{(\text{₹ } 5 - \text{₹ } 2.5)}$$

$$= 19,200 \text{ units}$$

$$2. \frac{[\text{Fixed Costs} + (\text{Setup Cost} \times \text{Setups}) + (\text{Engineering Cost} \times \text{Engineering Hours})]}{(\text{Sale Price} - \text{Variable Cost})}$$

$$= \frac{[36,500 + (\text{₹ } 150 \times 40) + (\text{₹ } 10 \times 215)]}{(\text{₹ } 5 - \text{₹ } 2.5)}$$

$$= 17,860 \text{ Units}$$

4. JIT Inventory System

"For successful operation of JIT inventory system, the suppliers chosen must be willing to make frequent deliveries in small lots. Rather than deliver a week's or a month's material at one time, suppliers must be willing to make deliveries several times a day and in the exact quantities specified by the buyer."

It is described in the problem that suppliers are not willing to

- make frequent deliveries and
- make supplies in the exact quantities as required

Accordingly, Mr. Smith's doubt is correct on successful implementation of JIT System.

5. Limiting Factor

Case	Basis for Selecting Priority of Product
If maximum sales (in value) is a limiting factor	Profit Volume Ratio
If raw material is a limiting factor	Contribution per unit of raw material required to produce one unit of a product
If labour hour is a limiting factor	Contribution per unit of labour hour required to produce one unit of a product
If there is a heavy demand for the product	Profit Volume Ratio

6. (i) Statement of Profitability of DRB Ltd

	Products (Amount in ₹)				
	D ₁	D ₂	D ₃	D ₄	Total
Sales	26,00,000	45,20,000	42,40,000	32,00,000	1,45,60,000
Direct Materials	6,00,000	18,20,000	18,80,000	10,00,000	53,00,000
Direct Wages	8,00,000	20,80,000	12,80,000	12,00,000	53,60,000
Overheads(W.N.2):					
Machine Related	1,60,000	1,56,000	64,000	2,40,000	6,20,000
Batch Related	1,00,000	1,30,000	80,000	1,50,000	4,60,000
Contribution	9,40,000	3,34,000	9,36,000	6,10,000	28,20,000
Product Specific Fixed Overheads	10,00,000	1,00,000	2,00,000	1,00,000	14,00,000
Gross Profit	(60,000)	2,34,000	7,36,000	5,10,000	14,20,000
General Fixed Overheads					6,20,000
Profit					8,00,000

(ii) Break-even Point

$$\begin{aligned}
 \text{Total Sale Value of Product 'D}_1\text{'} &= ₹ 26,00,000 \\
 \text{Total Contribution of Product 'D}_1\text{' } &= ₹ 9,40,000 \\
 \text{Specific Fixed Overheads (Product D}_1\text{)} &= ₹ 10,00,000 \\
 \text{Break-even Sales (₹)} &= \frac{\text{Specific Fixed Cost}}{\text{Total Contribution}} \times \text{Total Sales Value} \\
 &= \frac{₹ 10,00,000}{₹ 9,40,000} \times ₹ 26,00,000 \\
 &= ₹ 27,65,957.45
 \end{aligned}$$

$$\text{Break-even Sales (units)} = \frac{\text{₹ } 27,65,957.45}{\text{₹ } 13.00} = 2,12,766 \text{ units}$$

However, production must be done in batches of 100 units. Therefore, 2,128 batches are required for break even. Due to the production in batches, 34 units (2,128 batches × 100 units – 2,12,766 units) would be produced extra. These 34 units would add extra cost ₹ 282.20 (34 units × ₹ 8.3*). Accordingly, break-even units as calculated above will increase by 22 units $\left(\frac{\text{₹ } 282.20}{\text{₹ } 13.00}\right)$.

$$(*) \left(\frac{\text{₹ } 6,00,000 + \text{₹ } 8,00,000 + \text{₹ } 1,60,000 + \text{₹ } 1,00,000}{2,00,000 \text{ units}} \right)$$

Break-even units of product 'D₁' is 2,12,788 units (2,12,766 units + 22 units).

Workings

W.N.-1

Calculation Showing Overhead Rates

Overhead's Related Factors	Overhead Cost (₹) [a]	Total No. of Units of Factors [b]	Overhead Rate (₹) [a] / [b]
Machining Hours	6,20,000	15,50,000 hrs.	0.40
Batch Production	4,60,000	9,200 batches	50.00

W.N.-2

Statement Showing - Overhead Costs Related to Product

Particulars	D ₁	D ₂	D ₃	D ₄
Machining hrs. related overheads	₹1,60,000 (4,00,000 hrs × ₹0.40)	₹1,56,000 (3,90,000 hrs × ₹0.40)	₹64,000 (1,60,000 hrs × ₹0.40)	₹2,40,000 (6,00,000 hrs × ₹0.40)
Batch related overheads	₹1,00,000 (2,000 batches × ₹50)	₹1,30,000 (2,600 batches × ₹50)	₹80,000 (1,600 batches × ₹50)	₹1,50,000 (3,000 batches × ₹50)

7. Working Notes

(1) Calculation of Actual Sales at Budgeted Prices

	(₹)
Actual Sales at Actual Price	11,07,000
Less: Sales Price Variance (F)	17,000
Actual Sales at Budgeted Prices	10,90,000

$$\begin{aligned} \text{Activity Level} &= \frac{\text{Actual Sales at Budgeted Prices}}{\text{Budgeted Sales at Full Capacity}} \times 100 \\ &= \frac{\text{₹10,90,000}}{\text{₹13,50,000}} \times 100 \\ &= 80.74\% \end{aligned}$$

(2) Segregation of Fixed & Variable Cost Element from Semi-Variable Overheads

$$\begin{aligned} \text{Variable Overhead} &= \frac{\text{Overhead at Full Capacity} - \text{Overhead at 75\% Capacity}}{\text{Difference in Activity Level}} \\ &= \frac{\text{₹3,65,000} - \text{₹3,23,750}}{25} \\ &= \text{₹1,650} \\ \text{Fixed Overhead} &= \text{Total SV Overheads at 100\% Level} - \text{Variable Overheads at 100\% level} \\ &= \text{₹3,65,000} - (\text{₹1,650} \times 100) \\ &= \text{₹2,00,000} \end{aligned}$$

Flexible Budget at 80.74% Activity Level

(Amount in ₹)	
Sales	10,90,000
Less:	
Direct Material (₹4,25,000 × 80.74%)	3,43,148
Direct Labour (₹1,85,000 × 80.74%)	1,49,370
Variable Overheads (₹2,15,000 × 80.74%)	1,73,593
Semi-Variable Overheads	
Variable Cost (₹1,650 × 80.74%) [W.N.-2]	1,33,222
Fixed Cost [W.N.-2]	2,00,000
Profit	90,667

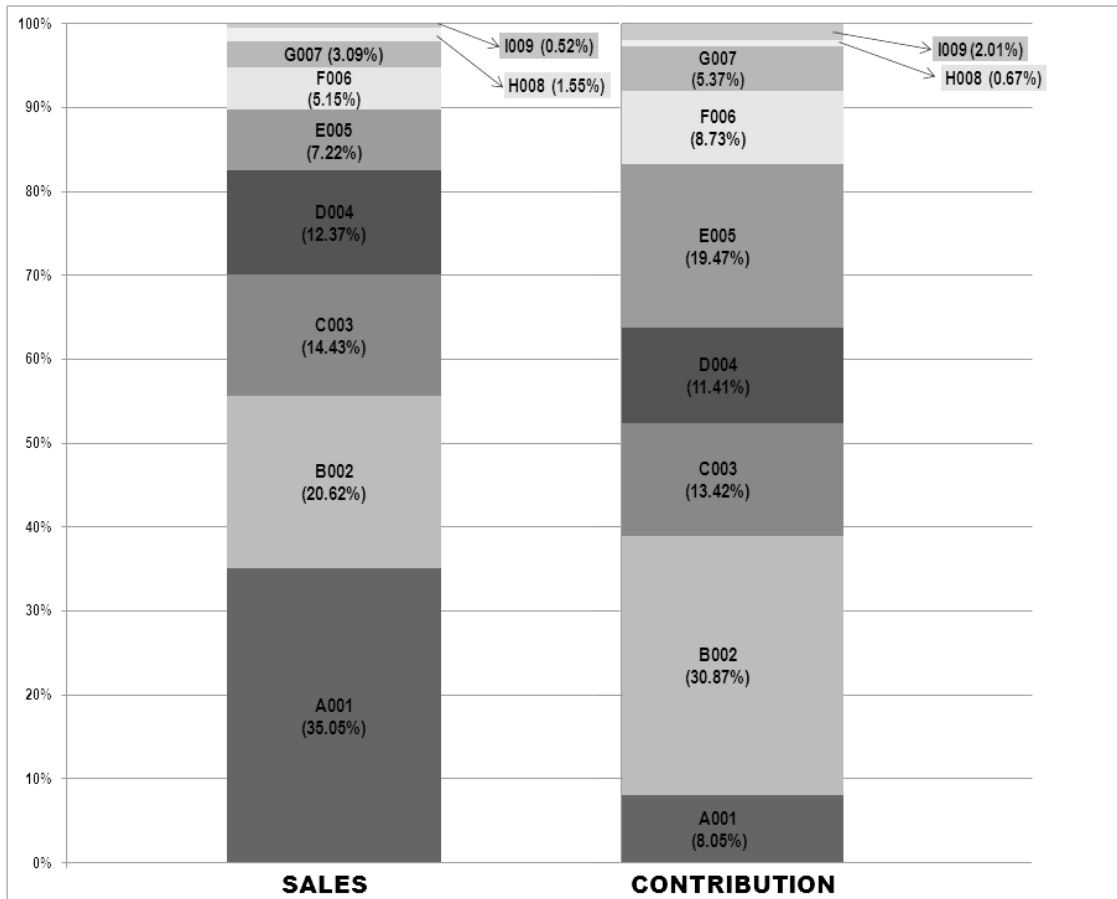
8. Statement Showing 'Pareto Analysis'

Model	Sales (₹'000)	% of Total Sales	Cumulative Total	Model	Cont. (₹'000)	% of Total Cont.	Cumulative Total %
Pareto Analysis Sales				Pareto Analysis Contribution			
A001	5,100	35.05%	35.05%	B002	690	30.87%	30.87%
B002	3,000	20.62%	55.67%	E005	435	19.47%*	50.34%
C003	2,100	14.43%	70.10%	C003	300	13.42%	63.76%

D004	1,800	12.37%	82.47%	D004	255	11.41%	75.17%
E005	1,050	7.22%	89.69%	F006	195	8.73%*	83.90%
F006	750	5.15%	94.84%	A001	180	8.05%	91.95%
G007	450	3.09%	97.93%	G007	120	5.37%	97.32%
H008	225	1.55%	99.48%	I009	45	2.01%	99.33%
I009	75	0.52%	100.00%	H008	15	0.67%	100.00%
	14,550	100.00%			2,235	100.00%	

(*) Rounding - off difference adjusted.

Diagram Showing 'Sales and Contribution'(NOT COMPULSORY)



This Diagram is shown for better understanding of the concept.

Recommendations

Pareto Analysis is a rule that recommends focus on most important aspects of the decision making in order to simplify the process of decision making. The very purpose of this analysis is to direct attention and efforts of management to the product or area where best returns can be achieved by taking appropriate actions.

Pareto Analysis is based on the 80/20 rule which implies that 20% of the products account for 80% of the revenue. But this is not the fixed percentage rule; in general business sense it means that a few of the products, goods or customers may make up most of the value for the firm.

In present case, five models namely A001, B002, C003, D004 account for 80% of total sales where as 80% of the company's contribution is derived from models B002, E005, C003, D004 and F006.

Models B002 and E005 together account for 50.34% of total contribution but having only 27.84% share in total sales. So, these two models are the key models and should be the top priority of management. Boths C003 and D004 are among the models giving 80% of total contribution as well as 80% of total sales so; they can also be clubbed with B002 and E005 as key models. Management of the company should allocate maximum resources to these four models.

Model F006 features among the models giving 80%of total contribution with relatively lower share in total sales. Management should focus on its promotional activities.

Model A001 accounts for 35.05% of total sales with only 8.05% share in total contribution. Company should review its pricing structure to enhance its contribution.

Models G007, H008 and I009 have lower share in both total sales as well as contribution. Company can delegate the pricing decision of these models to the lower levels of management, thus freeing themselves to focus on the pricing decisions for key models.

9. Statement of Reconciliation - Budgeted Vs Actual Profit

Particulars	₹
Budgeted Profit	5,19,000
Less:Sales Volume Contribution Planning Variance (Adverse)	52,125
Less:Sales Volume Contribution Operational Variance (Adverse)	93,825
Less:Sales Price Variance (Adverse)	39,600
Less:Variable Cost Variance (Adverse)	29,700
Less:Fixed Cost Variance (Adverse)	15,000
Actual Profit	2,88,750

Workings*Basic Workings*

$$\begin{aligned}
 \text{Budgeted Market Share (in \%)} &= \frac{2,00,000 \text{ units}}{4,00,000 \text{ units}} \\
 &= 50\% \\
 \text{Actual Market Share (in \%)} &= \frac{1,65,000 \text{ units}}{3,75,000 \text{ units}} \\
 &= 44\% \\
 \text{Budgeted Contribution} &= ₹ 21,00,000 - ₹ 12,66,000 \\
 &= ₹ 8,34,000 \\
 \text{Average Budgeted Contribution (per unit)} &= \frac{₹ 8,34,000}{₹ 2,00,000} \\
 &= ₹ 4.17 \\
 \text{Budgeted Sales Price per unit} &= \frac{₹ 21,00,000}{₹ 2,00,000} \\
 &= ₹ 10.50 \\
 \text{Actual Sales Price per unit} &= \frac{₹ 16,92,900}{₹ 1,65,000} \\
 &= ₹ 10.26 \\
 \text{Standard Variable Cost per unit} &= \frac{₹ 12,66,000}{₹ 2,00,000} \\
 &= ₹ 6.33 \\
 \text{Actual Variable Cost per unit} &= \frac{₹ 10,74,150}{₹ 1,65,000} \\
 &= ₹ 6.51
 \end{aligned}$$

Calculation of Variances

Sales Variances:.....

$$\begin{aligned}
 \text{Volume Contribution Planning*} &= \text{Budgeted Market Share \%} \times (\text{Actual Industry Sales Quantity in units} - \text{Budgeted Industry Sales Quantity in units}) \times (\text{Average Budgeted Contribution per unit}) \\
 &= 50\% \times (3,75,000 \text{ units} - 4,00,000 \text{ units}) \times ₹ 4.17 \\
 &= 52,125(A)
 \end{aligned}$$

(*)Market Size Variance

$$\begin{aligned} \text{Volume Contribution Operational}^{**} &= (\text{Actual Market Share \%} - \text{Budgeted Market Share \%}) \times (\text{Actual Industry Sales Quantity in units}) \times (\text{Average Budgeted Contribution per unit}) \\ &= (44\% - 50\%) \times 3,75,000 \text{ units} \times ₹ 4.17 \\ &= 93,825 \text{ (A)} \end{aligned}$$

(**)Market Share Variance

$$\begin{aligned} \text{Price} &= \text{Actual Sales} - \text{Standard Sales} \\ &= \text{Actual Sales Quantity} \times (\text{Actual Price} - \text{Budgeted Price}) \\ &= 1,65,000 \text{ units} \times (₹ 10.26 - ₹ 10.50) = 39,600 \text{ (A)} \end{aligned}$$

Variable Cost Variances:.....

$$\begin{aligned} \text{Cost} &= \text{Standard Cost for Production} - \text{Actual Cost} \\ &= \text{Actual Production} \times (\text{Standard Cost per unit} - \text{Actual Cost per unit}) \\ &= 1,65,000 \text{ units} \times (₹ 6.33 - ₹ 6.51) \\ &= ₹ 29,700 \text{ (A)} \end{aligned}$$

Fixed Cost Variances:.....

$$\begin{aligned} \text{Expenditure} &= \text{Budgeted Fixed Cost} - \text{Actual Fixed Cost} \\ &= ₹ 3,15,000 - ₹ 3,30,000 \\ &= ₹ 15,000 \text{ (A)} \end{aligned}$$



Fixed Overhead Volume Variance does not arise in a Marginal Costing system.

10. (i) Statement Suggesting Fare *per passenger – km* (Each Bus)

Particulars	Cost per annum (₹)
Fixed Expenses:	
Insurance	55,000.00
Garage Charges	33,000.00
Depreciation	7,70,000.00
Running Expenses:	
Repair and Maintenance	55,000.00
Cost of Lubricants and Sundries	1,38,517.50

Fuel Cost	5,54,070.00
Salary of Driver and Two Attendants	3,30,000.00
Route Permit Charges	16,500.00
Total Cost <i>per annum</i>	19,52,087.50
Add: Markup @ 20% of Total Cost or 16.67% of Total Revenue	3,90,417.50
Total Revenue	23,42,505.00

Rate *per passenger-km* equals to ₹1.395

Workings

Total Passenger Kms	=	2,51,85,000
Total Buses	=	15
Passenger Kms <i>per bus</i>	=	16,79,000 (2,51,85,000 Kms / 15)
Total Passenger Capacity <i>per bus</i>	=	42 – 2
	=	40
Annual Distance Covered <i>by a bus</i>	=	41,975 Kms. (16,79,000Kms/40)

(ii) Regulated Fare *per passenger km* is ₹1.35

Profitability Statement for *Each Bus*

Particulars	Year 1 (₹)	Year 2 (₹)
Fixed Expenses:		
Insurance	59,400.00	64,152.00
Garage Charges	35,640.00	38,491.20
Depreciation	7,70,000.00	7,70,000.00
Running Expenses:		
Repair and Maintenance	59,400.00	64,152.00
Cost of Lubricants and Sundries	1,49,598.90	1,61,566.81
Fuel Cost	5,98,395.60	6,46,267.25
Salary of Driver and Two Attendants	3,56,400.00	3,84,912.00
Route Permit Charges	16,500.00	16,500.00
Total Cost ...[A]	20,45,334.50	21,46,041.26
Total Revenue (Regulated) ...[B]	22,66,650.00	22,66,650.00
Gross Margin ...[B] – [A]	2,21,315.50	1,20,608.74
Gross Margin to Total Revenue	9.76%	5.32%

The gross margin is showing a downward trend because the cost components have taken into the effect of inflation hence increasing year by year but the total revenue has remained stagnant due to Government regulations which resulted in reduction in gross margin per bus.

The company's gross margin to total revenue ratio has come out to be 9.76% and 5.32% in first and second year respectively but initially the company's desired gross margin to total revenue ratio is 16.67% to cover general overheads and sufficient profit. Though the amount of general overheads is not given but we can safely assume that they may also subject to inflation i.e. increase year by year then in such case the company needs to maintain or increase its gross margin per bus to maintain its net profit after general overheads which is not possible in regulated environment. The information about regulated fare in the given case is regarding first two years only but if this regulated fare scenario persists for further years then the project may not be viable for the company.

11. (i) **Transfer Price *per unit* of Product Z that Division W Should Quote *in order to meet* Target Profit**

Quotation for the 40,000 units of product Z should be such that meet Division W's target profit and interest cost on working capital. Therefore the minimum quote for product Z will be calculated as follows:

Particulars	Amount (₹)
Target Profit (given for the year)	2,50,00,000
Add: Interest Cost on Working Capital (₹12,00,00,000 @11.5%)	1,38,00,000
Required Profit	3,88,00,000
Add: Fixed Overhead	4,00,00,000
Target Contribution	7,88,00,000
Less: Contribution Earned --- External Sales {60,000 units × (₹2,500 – ₹1,600)}	5,40,00,000
Contribution Required – Internal Sales	2,48,00,000
Contribution <i>per unit</i> of Product Z (₹2,48,00,000 ÷ 40,000 units)	620
Transfer Price of Product Z to Division B (Variable Cost <i>per unit</i> + Contribution <i>per unit</i>)	2,220

(ii) **The Two Transfer Prices Based on Opportunity Costs**

For the 30,000 units (i.e. maximum capacity – maximum external market demand) at variable cost of production i.e. ₹1,600 per unit.

For the next 10,000 units (i.e. external market demand – maximum possible sale) at market selling price i.e. ₹2,500 per unit.

12. Let the P_1 , P_2 and P_3 be the three products to be manufactured. Then the data are as follows:

Products	Product ingredients			
	A	B	C	Inert Ingredients
P_1	5 %	10%	5%	80%
P_2	5%	5%	10%	80%
P_3	20%	5%	10%	65%
Cost per kg (₹)	64	16	40	16

Cost of Product P_1

$$= 5\% \times ₹ 64 + 10\% \times ₹ 16 + 5\% \times ₹ 40 + 80\% \times ₹ 16$$

$$= ₹ 19.60 \text{ per kg}$$

Cost of Product P_2

$$= 5\% \times ₹ 64 + 5\% \times ₹ 16 + 10\% \times ₹ 40 + 80\% \times ₹ 16$$

$$= ₹ 20.80 \text{ per kg.}$$

Cost of Product P_3

$$= 20\% \times ₹ 64 + 5\% \times ₹ 16 + 10\% \times ₹ 40 + 65\% \times ₹ 16$$

$$= ₹ 28.00 \text{ per kg.}$$

Let x_1 , x_2 , and x_3 be the quantity (in kg) of P_1 , P_2 , and P_3 respectively to be manufactured. The LP problem can be formulated:

Objective function:

$$\begin{aligned} \text{Maximise } Z &= (\text{Selling Price} - \text{Cost Price}) \times \text{Quantity of Product} \\ &= (₹32.60 - ₹19.60) x_1 + (₹34.80 - ₹20.80) x_2 + (₹36.00 - ₹28) x_3 \\ &= 13x_1 + 14x_2 + 8x_3 \end{aligned}$$

Subject to Constraints:

$$1/20 x_1 + 1/20 x_2 + 1/5 x_3 \leq 100$$

$$\text{Or } x_1 + x_2 + 4x_3 \leq 2,000$$

$$1/10 x_1 + 1/20 x_2 + 1/20 x_3 \leq 180$$

$$\text{Or } 2x_1 + x_2 + x_3 \leq 3,600$$

$$1/20 x_1 + 1/10 x_2 + 1/10 x_3 \leq 120$$

$$\text{Or } x_1 + 2x_2 + 2x_3 \leq 2,400$$

$$x_1 \leq 30$$

$$\text{and } x_1, x_2, x_3 \geq 0$$

13. The given information can be tabulated in following transportation problem-

Manager	Assignment			Time Available (Hours)
	TA (₹)	TPA (₹)	GCR (₹)	
C ₁	1,800	2,250	2,850	176
C ₂	2,100	1,950	1,800	176
C ₃	2,400	2,100	2,250	176
Time Required (Hours)	143	154	176	

The given problem is an unbalanced transportation problem. Introducing a dummy assignment to balance it, we get-

Manager	Assignment				Time Available (Hours)
	TA (₹)	TPA (₹)	GCR (₹)	Dummy (₹)	
C ₁	1,800	2,250	2,850	0	176
C ₂	2,100	1,950	1,800	0	176
C ₃	2,400	2,100	2,250	0	176
Time Required (Hours)	143	154	176	55	528

The objective here is to maximize total billing amount of the auditors. For achieving this objective, let us convert this maximization problem into a minimization problem by subtracting all the elements of the above payoff matrix from the highest payoff i.e. ₹2,850.

Manager	Assignment				Time Available (Hours)
	TA (₹)	TPA (₹)	GCR (₹)	Dummy (₹)	
C ₁	1,050	600	0	2,850	176
C ₂	750	900	1,050	2,850	176
C ₃	450	750	600	2,850	176
Time Required (Hours)	143	154	176	55	528

Now, let us apply VAM method to the above matrix for finding the initial feasible solution.

Manager	Assignment				Time Avail. (Hours)	Difference		
	TA (₹)	TPA (₹)	GCR (₹)	Dummy (₹)				
C ₁	1,050	600	0	176	2,850	176/0	600 - -	
C ₂	750	900	121	1,050	2,850	55	176/55/0	150, 150 1,950
C ₃	450	143	750	33	600	2,850	176/33/0	150, 300, 2,100
Time Required	143/0	154/121/0	176/0	55/0		528		
Difference	300	150	600	0				
	300	150	-	0				
	-	150	-	0				

The initial solution is given below. It can be seen that it is a degenerate solution since the number of allocation is 5. In order to apply optimality test, the total number of allocations should be 6 ($m + n - 1$). To make the initial solution a non-degenerate, we introduce a very small quantity in the least cost independent cell which is cell of C₃, GCR.

Manager	Assignment						
	TA (₹)	TPA (₹)	GCR (₹)	Dummy (₹)			
C ₁	1,050	600	0	176	2,850		
C ₂	750	900	121	1,050	2,850	55	
C ₃	450	143	750	33	600	e	2,850

Let us test the above solution for optimality-

($u_i + v_j$) Matrix for Allocated / Unallocated Cells

					u_i
	-150	150	0	2,100	-600
	600	900	750	2,850	150
	450	750	600	2,700	0
v_j	450	750	600	2,700	

Now we calculate $\Delta_{ij} = C_{ij} - (u_i + v_j)$ for non basic cells which are given in the table below-

Δ_{ij} Matrix

1,200	450		750
150		300	
			150

Since, all allocations in $\Delta_{ij} = C_{ij} - (u_i + v_j)$ are non negative, the allocation is optimal. The allocation of assignments to managers and their billing amount is given below:

Manager	Assignment	Billing Amount
C ₁	Global Compliance & Reporting (GCR)	₹5,01,600 (176 hrs. × ₹2,850)
C ₂	Tax Performance Advisory (TPA)	₹2,35,950 (121 hrs. × ₹1,950)
C ₃	Tax Accounting (TA)	₹3,43,200 (143 hrs. × ₹2,400)
C ₃	Tax Performance Advisory (TPA)	₹69,300 (33 hrs. × ₹2,100)
Total Billing		₹11,50,050

14. (i) Invalid

Reason: As per the rules of network construction, parallel activities between two events, without intervening events, are prohibited. Dummy activities are needed when two or more activities have same initial and terminal events. Dummy activities donot consume time or resources.

(ii) Valid

Reason: As per the conventions adopted in drawing networks, the head event or terminal node always has a number higher than that of initial node or tail event.

(iii) Invalid

Reason: The difference between the latest event time and the earliest event time is termed as slack of an event. Free float is determined by subtracting head event slack from the total float of an activity.

(iv) Invalid

Reason: For every critical activity in a network, the earliest start time and the latest starttime is same and also the earliest finish time and the latest finish time is same.

(v) Invalid

Reason: The optimum duration is the time period in which the total cost of the project is minimum.

(vi) Valid

Reason: Resource leveling is a network technique used for reducing the requirement of a particular resource due to its paucity or insufficiency within a constraint on the project duration. The process of resource leveling utilize the large floats available on non-critical activities of the project and cuts down the demand of the resource.

15. Allocation of Random Numbers

Raw Material			Wages & Other Variable Overheads			Sales		
Mid Point	Cum. Prob.	Random Nos.	Mid Point	Cum. Prob.	Random Nos.	Mid Point	Cum. Prob.	Random Nos.
9	0.2	0 – 1	12	0.3	0 – 2	36	0.1	0
11	0.5	2 – 4	14	0.8	3 – 7	40	0.4	1 – 3
13	0.8	5 – 7	16	1.0	8 – 9	44	0.8	4 – 7
15	1.0	8 – 9				48	1.0	8 – 9

Simulation Table

(₹ in 000)

Month	Raw Material	Wages & Other V.O	Sales	Fixed Cost	Net Cash Flow	Cash Balancing (Opening ₹40 thousand)
1	11	12	36	15	-2	38
2	11	14	44	15	+4	42
3	9	16	44	15	+4	46
4	9	12	36	15	0	46
5	11	16	40	15	-2	44
6	13	16	48	15	+4	48

16. (i) Variable cost per unit that will be effected by learning and experience curve is ₹2,200 (₹4,400 – 50% of ₹ 4,400).

Let, 'r' be the learning curve rate.

No. of Batch (x)	Cumulative Average Cost per unit (y)
1	2,200
2	2,200 r
4	2,200 r ²

If $2,200 r^2 = ₹1,920$ (₹4,120 – 50% of ₹ 4,400)
 $r^2 = 0.8727$
 $r = 0.934$
 Therefore, Learning Curve Effect = 93% (rounded off)

(ii) Calculation of Optimum Price

Price per unit (₹)	Demand (units)	Variable Cost per unit * [W.N.] (₹)	Variable Cost per unit ** (₹)	Total Variable Cost per unit (₹)	Contribution per unit (₹)	Total Contribution (₹)
11,100.00	1,000	2,200.00	2,200.00	4,400.00	6,700.00	67,00,000
10,700.00	2,000	2,046.00	2,200.00	4,246.00	6,454.00	1,29,08,000
9,600.00	3,000	1960.86	2,200.00	4,160.86	5,439.14	1,63,17,420
8,700.00	4,000	1,902.78	2,200.00	4,102.78	4,597.22	1,83,88,880

(*) This represents variable cost part which is affected by the learning and experience curve effect.

(**) This represents variable cost part which is not affected by the learning and experience curve effect.

Working Note [W.N.]

Variable Cost per unit

Output in Batches (x)	Average Cost of the First Unit (a)	$x^{-0.1047}$	Cumulative Average Cost per unit (y)
1	2,200	1.0000	2,200.00
2	2,200	0.9299	2,046.00
3	2,200	0.8913	1,960.86
4	2,200	0.8649	1,902.78

$y = ax^b$

Where,

- y = Cumulative average unit costs
- a = Average cost of the first unit
- x = Cumulative number of batches
- b = $\text{Log of learning ratio} \div \text{Log of 2}$
 $= \log 0.93 \div \log 2$
 $= -0.0315 \div 0.3010 = -0.1047$