

MOCK TEST PAPER – 1

FINAL COURSE: GROUP – II

PAPER – 5: STRATEGIC COST MANAGEMENT AND PERFORMANCE EVALUATION

SUGGESTED ANSWERS/HINTS

1. (i) Usually, we notice a suit of prices of products being determined based on the cost of their production, keeping a room for desired margin. In contrary to this, the then originated Japanese concept tells us to estimate selling price at first place, to be determined based on the price the market is currently willing to pay for a similar product. Thus, the prices here are not based on the cost of their products rather costs have to be targeted and thus the name “Target Costing”. This means once price is determined and profits are set aside, the remainder becomes the costs to be achieved. In striving to reach the cost goal, myriad managerial techniques and tools like Value Chain Analysis/ Value Reengineering, Six Sigma, are used. These techniques are used keeping in mind the focus (i.e., to control cost in order to meet the target without compromising the quality and value to be derived from the product). As such, various costs incurred with respect to product like design cost, manufacturing cost, storage cost, transportation cost are destined to be controlled.

Target Cost concept is very much relevant in KPA’ situation since it is considering to digitize its business where *competition is intense* specifically with regards to the prices of similar products. Since the products offered by Dreams Homes *lack much differentiation*, **the unique selling point of the firm can be to offer quality products at low prices**. Further, E Commerce will mostly require the firm to operate as per Just in Time (JIT) approach that will reduce inventory maintenance burden and also reduce wastage, thereby controlling costs. Thus, Target Costing and E Commerce go hand in hand.

We must also keep in mind that the firm can apply Target Costing concept to both its manufactured products and the products purchased out-rightly. For the merchandise goods, KPA can plan to control various fixed cost (i.e., storage and inspection cost) and variable cost (i.e., selling cost) incurred to handle such goods such that lower prices can appeal wider customer base. Moreover, to achieve low costs for its supplied products, it will have to enter into *long term contracts* with dedicated suppliers. Considering the E Market, the scope of its operations will expand and therefore the demand may also increase. Thus, suppliers can funnel the discounts in form of low prices only if a commitment for long term purchases is made by the firm.

- (ii) **Currently**, KPA operates physical stores at which time inventories of raw materials, WIP and finished products are maintained at the stores and in warehouses considering the demand directly dependent upon the store locations. It has been blocking large assets in form of various *inventories piled up* to coordinate its production and retail function.

The three forms of inventories related to products that Dream House manufactures are maintained in a *traditional manner* which seems to be out of the place for an E Retailer. Dream House forecasts demand based on its *internal policies* and *historical trends*. Today demand in every sector of the market changes by leaps and bounds, so using historical data is not at all recommended. *Demand forecasts should be pulled by current market trends and prediction of future market sentiments*. For example, Corona Virus pandemic has drastically changed the face of world, where demand for some products have taken a leap while some will continue sitting on

the shelves for a prolonged period. People are refraining themselves from going to stores and online retailers like Amazon are reaping the benefits from this situation.

In the process of maintaining inventory, KPA is also building up *too much safety stock* which takes up cost and space. The *lead time of the firm is remarkably high* relative to industry standards, which is untenable in an E Environment. Failure to accommodate customers request as per industry norms, means *losing a large chunk of customers* who do not want to wait.

Now when the firm is thinking of **going digital**, the scenario will be totally different. With the switch over to ecommerce, production and purchase mechanism will also have to undergo a drastic change. *Just in time purchasing and production technique* will put an end to the harrowing task of inventory management. In this form of pull system, purchasing of merchandise goods and production of in-house goods will be based on online customer demands and KPA will have to accordingly coordinate with its suppliers to supply the right quantity of raw materials required at the right time. JIT inventory management calls for having the inventory as and when needed also taking care of massive holding cost suffered related to large build ups. The trick is to set up plants in close proximity to chain of suppliers' location to ensure several pick-ups each day rather than holding on to bulks. ERP and other sources of *electronic data interchange* between supplier and KPA will act as backbone in supporting the JIT activity. In this environment, Dream House will also be able to *reduce the lead time* to deliver the ordered products from 4 weeks to around 2.5 weeks by *streamlining the flow of information* in entire supply chain.

For the products purchased from its suppliers, it is recommended that KPA should employ **vendor managed inventory technique**. Under this, rather than firm controlling the inventory management system, it is the suppliers who manage it. This is implemented by allowing the suppliers of the firm to access the inventory information from all locations i.e., warehouse, retail stores and distribution centers. They access the inventory data and then decide accordingly on sending/ replenishing the inventories. For example, using the point of sales technology, data from stores can flow to centralized database showing units sold and units in the stores, that can be accessed by suppliers to anticipate demand and refill requirement in each store. Similarly, to manage the inventory at warehouse, RFID (radio frequency identification) technique can be used to pick up, process and ship the order. For an inbound shipment too, this technology can easily scan the product information in seconds, leaving no room for human intervention. The access of this real time data can be allowed to vendor, to manage KPA' inventory.

In a nutshell, the onus and cost of inventory management passes on to the suppliers, thereby underpinning the cost leadership strategy of KPA. Low cost of inventory management will consequently reduce the overall cost of inventory and thus help, in achieving set cost targets.

(iii) The supply chain management system of KPA can be designed in the following manner:

- a) As already known, E Commerce firms works on low inventories relative to physical stores, therefore KPA is pondering about changing its inventory management technique. So, it is time for the firm to focus on *building strong collaborations with suppliers* so that the lead time of orders placed by KPA can be kept at minimum. Quality of the product offered by such suppliers also cannot be overlooked anymore since E Sellers not only make speedy shipments but also guarantee hassle free returns of the delivered product if their products fail to meet the specifications given in their website. Strong tie up with suppliers will assist the firm in meeting the ever-changing demand of its customers in this technological landscape.

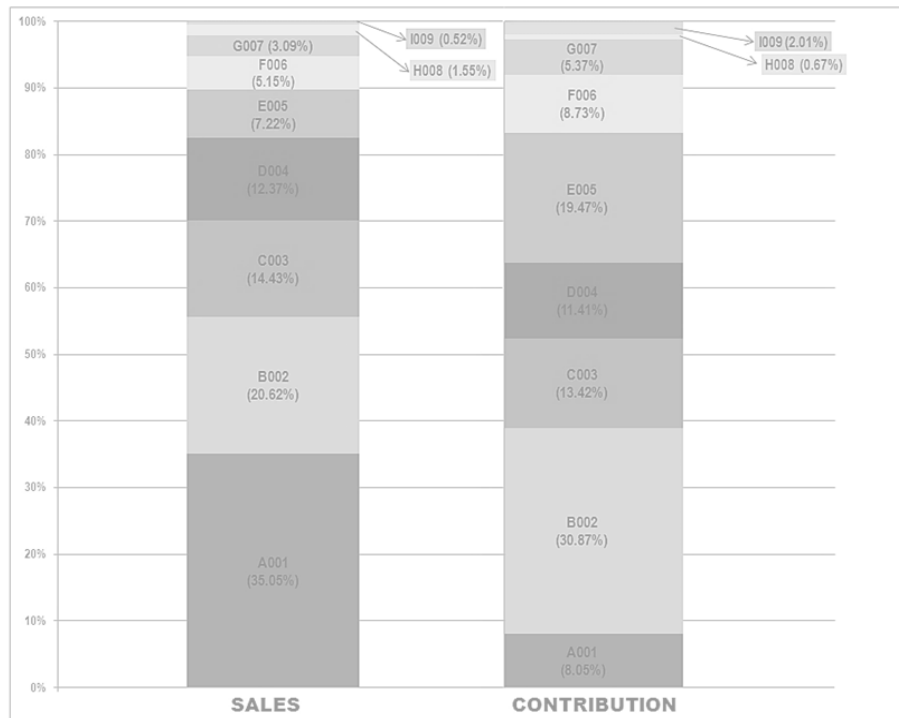
- b) Moreover, by implementing *vendor managed inventory*, as an effective SCM tool, much of the onus of inventory management for its purchased products will shift onto suppliers.
- c) For the in-house manufactured products, KPA needs to ensure that there is pool of dedicated suppliers in the country who can supply expected materials on a timely basis. Further, in the areas where there is dearth of such suppliers, it will have to arrange transportation of the finished goods. To keep the overall cost of product low, it should abide by the cost per touch inventory system (successfully employed by the prominent furniture brand IKEA. It relies on the concept of passing the cost savings to its customers by putting up their products together in easy to assemble packaging enabling their customers themselves to select and pick up the product from the store. In a nutshell, less the products get touched in shipping and subsequent storage process less will be the overall cost of product).
- d) Most E Retailers maintain number of distribution centers close to their customer locations such that the outbound logistics process works in a seamless fashion and customers end up receiving their packages on the promised dates. For this to happen, KPA should be ready to *make large capital investments in setting up distribution centers in the densely populated parts of Indian cities*.
- e) For the picking process of the goods in line with the order, it can make use of *multi-faceted robotics technology with some human participation*. This technology can assist human pickers in locating the required goods faster and with minimal error, thereby speeding up the entire flow.
- f) In the marketing section of supply chain, KPA should *use skillful data scientists to pull overwhelming data based on customer searches* which can be analyzed to recommend products most useful to them. Further it could resort to TV advertisements, public banners and other prominent modes to propagate the digitization of its business.

2. "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”



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. Both 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.

3. (i) Balanced Score Card

Perspectives	Objective	Measures	Targets	Initiatives
Financial				
EVA (₹ Millions)	Grow EVA	Absolute	₹ 1,435 Million	- Repay ₹ 500 Million of debt - Reduce working capital - Improve profit through top line growth and cost reduction
Working Capital	Reduce working capital	Reduce inventory and debtors by 5 days each	₹ 300 Million reduction (₹ 170 + ₹ 130)	- MIS on inventory and debtors on real-time basis - Weekly short meetings on inventory and debtors to monitor and initiate actions to achieve targets
Customer				
New Products	Increase over 2022	As a % to Sales	From x % to y %	- Meet <i>existing customers</i> with new product offerings - Meet <i>new customers</i> and find out their requirements - Participate in exhibitions
On time Delivery	Increase over 2022	% of deliveries on time to total deliveries	From x % to y %	- Strengthen production planning and control process - Leverage IT systems for accurate and timely information flow on orders, delivery dates
Internal Process				
Manpower Productivity	Increase output per man per day	As agreed under the long-term settlement	From XX to YY	- Training of employees - Improved communication - Improved supervision
Cost Reduction	Reduce cost of Production	- Raw material costs - Outsourcing costs - Overheads	₹ 500 Million Reduction	- Alternate sources for raw material - Improve yields through <i>value engineering</i> <i>Make or buy</i> on certain high-cost outsourced components - Reduction in travel costs (use video conferencing), - Monitor other costs to save
New Product Approval by Customer	For expediting approval of "NP"	Reduction in time taken for approval	By 2 months	- Form a task force - Weekly progress monitoring by CEO - Use of PERT/CPM tools

Learning and Growth				
Train senior technical staff in new technologies (products for defense, aerospace)	To keep pace with changing technologies and to de risk exposure to few sectors	Timeline	By MMY (e.g., Dec 24)	- Specific training - Participation in seminars on new technologies
Explore possibilities for tie-ups on products for Electric Vehicles.	Future growth Through products for Electric Vehicles	Timeline	By MMY (e.g., Jun 24)	- Appoint a consultant - To look at possible partner - Prepare a road map to achieve the objective

(ii) **Rationale for each of the above perspectives:**

- EVA has been included under “Financial Perspective” as this is what the company intends to drive the same and it is a good measure of shareholder value as it takes into consideration cost of equity which a normal profitability metric ignores. Working Capital is included, as an improvement in the working capital measure would affect cost of capital and hence EVA.
- New products and improvements in delivery times have been included under “Customer Perspective” as these have to be driven to achieve the sales volumes beyond normal industry growth. This will ultimately improve sales, profits and hence EVA.
- Manpower productivity and cost reduction have been included under “Internal Perspective” as these have to be monitored and further efforts taken to reduce other costs to achieve the cost reduction planned to finally achieve the profits required to deliver the EVA.
- As the balanced score card is just not a short-term measure, initiatives on new products, technologies and new markets have been included in the “Learning and Growth” perspectives to plan for long term sustained growth and to ensure that the company stays relevant in a changing business environment.

(iii) **EVA Calculations**

Particulars	2022 (Est.) ₹ Million	Budget 2023 ₹ Million
PAT	1,610	2,170
Add: Interest adjusted for tax {Interest × (1-0.3)}	140	140
NOPAT	1,750	2,310
Capital Employed (see assumptions below)		
Equity (14%)	3,000	3,000
Reserves	1,000	2,250
Debt (10%)	2,000	2,000
Cost of Capital		
Equity (14%)	420	420

Reserves (14%)	140	315
Debt {10% × (1-0.3)}	140	140
Cost of Capital	700	875
EVA (NOPAT – Cost of Capital)	1,050	1,435

Assumptions

For 2022 estimated, Capital Employed is opening equity, reserves and debt. Similarly, for budget 2023, for calculating Capital Employed, opening equity, reserves have been considered.

Economic and accounting depreciation were assumed to be the same.

4. (a) (i) Valid, target costing is applied where the price is market determined and in the existence of competitive environment. In monopoly market, a firm is a price maker hence, target costing method is not applicable to a monopoly market.
- (ii) Valid, in case of target costing the aim is to confine the total cost to set target. To achieve this target cost figure, *non-value added activities are eliminated and hence ignored*.
- (b) For each day, 'N' spends ₹360 per clerk (₹90 per hr. × 4 hrs.). Therefore, 'N' spends ₹1,080 per day to employ three clerks. Annually, this outlay amounts to ₹2,59,200 (₹1,080 per day × 240 days).

Over five years, the outlay would be ₹12,96,000. If the WCMS is implemented, the initial cost is ₹1,25,000. If we add the annual cost of ₹36,000, the total cost over five years amounts to ₹3,05,000. Since one clerk will be needed as well, 'N' has to incur ₹4,32,000 over five years to pay clerk (₹4,32,000 = ₹90 × 4 hrs. × 1 clerk × 240 days × 5 years). Therefore, the total cost of this option is ₹7,37,000.

Accordingly, there is cost saving of ₹5,59,000 from WCMS implementation.

Relevant Non-Financial Considerations

The WCMS may be a lot more efficient, but more rigid. For instance, what if, a student forgets to bring his/ her card or transaction failure due to connectivity issue, and may not have enough cash to pay. Automated systems may be less able to handle these situations. Having clerks may add an aspect of flexibility and a human aspect that is hard to quantify.

Conclusion

Obviously, WCMS option is more cost effective for 'N' because there is a cost saving of ₹5,59,000. But, non- financial factors should also be taken into consideration.

OR

Statement of Total Contribution

Sales Price p.u. (₹)	Variable Cost p.u. (₹)	Contribution p.u. (₹)	Sales Volume (units) (₹)	Total Contribution (₹)
(1)	(2)	(3) = (1) – (2)	(4)	(5) = (3) × (4)
27.50	17.00	10.50	7,500	78,750
27.00	17.00	10.00	8,000	80,000
26.50	17.00	9.50	8,500	80,750
26.00	17.00	9.00	9,000	81,000
25.50	17.00	8.50	9,500	80,750
25.00	17.00	8.00	10,000	80,000

24.50	17.00	7.50	10,500	78,750
24.00	17.00	7.00	11,000	77,000

From the above statement it is quite apparent that the contribution would be maximum at a sale price of ₹26 per unit and sales demand of 9,000 units.

- (c) (i) Should the Division X reduce the selling price by ₹ 20 per unit...?

Statement Showing 'Impact of Selling Price Reduction'

Particulars	₹
Incremental Revenue	
Additional Sales Revenue (9,600 units × ₹ 180)	17,28,000
Loss of Revenue (30,000 units × ₹ 20)	(6,00,000)
Total (A)	11,28,000
Incremental Cost	
Component Purchase Costs (9,600 units × ₹ 35)	3,36,000
Other Variable Costs $\left(\frac{9,600 \text{ units} \times ₹ 16,80,000}{30,000 \text{ units}} \right)$	5,37,600
Variable Marketing Costs $\left(\frac{9,600 \text{ units} \times ₹ 2,70,000}{30,000 \text{ units}} \right)$	86,400
Total (B)	9,60,000
Savings/ (Loss) ... (A) - (B)	1,68,000

Comment

Above *incremental analysis* clearly indicates that the reduction of Selling Price by ₹ 20 per unit shall be accepted as it increases the Profit of the concern by ₹ 1,68,000.

- (ii) Should the Division Y be willing to supply 39,600 units to Division X...?

Statement Showing 'Minimum Average Transfer Price' per component (39,600)

Particulars	₹
Variable Cost	15.00
Loss of Contribution* [14,600 units × (₹ 50 - ₹ 15 - ₹ 3) / 39,600 units]	11.80
Transfer Price	26.80

(*) Division Y has surplus capacity to the extent of 25,000 units, for additional 14,600 units the Transfer Price must consider the Division Y's Variable Costs of Manufacturing the Component *plus* the Lost Contribution Margin (that will result from *losing outside sales*).

Company's Perspective

Particulars	₹
Market Price per component	35.00
Relevant Cost for Transfer per component (from above)	26.80
Saving per component	8.20
Units	39,600
Total Savings	3,24,720

Comment

It is not in the interest of the Division Y to transfer 39,600 units to Division X at Price below the Minimum Average Transfer Price based on Opportunity Cost. However, from the Concern's Perspective, internal transfer between Divisions is beneficial as each unit to be transferred is offering a saving of ₹ 8.20.

5. (a) For the same quantity, sales value will reduce by 8% of (1,00,000 units × ₹ 150) = ₹ 12 lakhs. For maintaining the same amount of profit, cost also has to be reduced by ₹ 12 lakhs, which can be achieved as under –

Particulars	₹ in lakhs
Savings: Reduction in Wages (Due to higher labour productivity, wages will be 30/1.25 = ₹ 24.00 lakhs)	6.00
Elimination of Wastage of Materials = 1% of ₹ 50 lakhs	0.50
Savings in Packaging Cost (given)	1.35
Savings in Maintenance Cost (given)	0.80
Sub-Total Savings ... (A)	8.65
Loss in Disposal of Old Machine (₹3 lakhs – ₹2.25 lakhs)	0.75
Difference in Depreciation (₹10 lakhs – ₹3 lakhs) × 10%	0.70
Cost of Capital Investment (₹10 lakhs × 12%)	1.20
Sub-Total Costs ... (B)	2.65
Effective Cost Reduction before considering removal of supervisors ... (A) – (B)	6.00
Additional reduction required for meeting Target Cost, by removing supervisors (₹12 lakhs – ₹6 lakhs)	6.00

Hence,

Number of Supervisors to be Removed = ₹6 lakhs / ₹1.20 lakhs = 5 Supervisors

- (b) (i) In participative budgeting, subordinate managers create their own budget and these budgets are reviewed by senior management. Such budget communicates a sense of responsibility to subordinate managers and fosters creativity. This is also called bottom up approach (sometime referred as participative approach).

As the subordinate manager creates the budget, it might be possible that the budget's goals become the manager's personal goal, resulting in greater goal congruence. In addition to the behavioural benefits, participative budgeting also has the advantage of involving individuals whose knowledge of local conditions may enhance the entire planning process.

The participative budget described here appears participative in name only. In virtually every instance, the participative input is subject to oversight and discussion by sales manager. Some amount of revision is also common. However, excessive and arbitrary review that substitutes a top-down target for a bottom-up estimate makes a deceit process. Such a gutting appears to be the case in EWPL. J's statement indicates a very autocratic style. The revision process also seems to be arbitrary and capricious. There is little incentive for the salesgirls to spend much time and effort in projecting the true expected sales because they know that the target would be revised again and J's estimate will prevail. This situation creates an interesting discussion about the costs and benefits of participative budgeting and gives rise to game playing and slack.

- (ii) In top down approach, budget figures will be imposed on sales personnel by senior management and sales personnel will have a very little participation in the budget process. Such budget will not interest them since it ignores their involvement altogether. While in bottom up approach, each sales person will prepare their own budget. These budgets will be combined and reviewed by seniors with adjustment being made to coordinate the needs and goals of overall company. Proponents of this approach is that salespersons have the best information of customer's requirements, therefore they are in the best position in setting the sales goal of the company. More importantly, salespersons who have role in setting these goals are more motivated to achieve these goals. However, this approach is time-intensive and very costly when compared with top down approach. In order to achieve personal goals, participants may also engage in politics that create budgetary slack and other problems in the budget system.

Since both top down and bottom up approaches are legitimate approaches, so EWPL can use combination of both. Seniors know the strategic direction of the company and the important external factors that affect it, so they might prepare a set of planning guidelines for the salesgirls. These guidelines may include forecast of key economic variables and their potential impact on the EWPL, plans for introducing and advertising a new product and some broad sales targets etc. With these guidelines, salesgirls might prepare their individual budget. These budgets need to be reviewed to validate the uniformity with the EWPL's objectives. After review, if changes are to be made, the same should be discussed with salesgirls involved.

6. (a) (i) AB Compounds has the opportunity to utilize 10 units of non-moving chemical as input to produce 10 units of a product demanded by one of its customers. The minimum unit price to be charged to the customer would be—

Cost Component	Cost per unit of product (₹)
Cost of Material (Realizable value = ₹3,500 / 10 units of chemical)	350
Out of Pocket Expenses	50
Other Material Cost	80
Minimum Unit Price that can be charged	480

Therefore, the minimum unit price that can be charged to the customer, without incurring any loss is ₹480 per unit of product. As explained below in point (ii), allocated overhead expenses and labor cost are sunk costs that have been ignored while calculating the minimum unit price to be charged.

(ii) Analysis

- (a) Cost of Material: Relevant and hence included at realizable value. AB Compounds has 10 units of non-moving chemical input that has a book value of ₹2,400, realizable value of ₹3,500 and replacement cost of ₹4,200. Realizable value of ₹3,500 would be the salvage value of the chemical had it been sold by AB Compounds instead of using it to meet the current order. This represents an opportunity cost for the firm and hence included while pricing the product. Book value would represent the cost at which the inventory has been recorded in the books, a sunk cost that has been ignored. Replacement cost of ₹4,200 would be the current market price to procure 10 units of the input chemical. This would be relevant only when the inventory has to be replenished after use. This chemical is from the non-moving category, that means that

it is not used regularly in production process and hence need not be replenished after use. Therefore, replacement cost is also ignored for pricing.

- (b) Labour Cost: Not relevant and hence excluded from pricing. It is given in the problem that this order would be met by permanent employees of the firm. Permanent employee cost is a fixed cost that AB Compounds would incur irrespective of whether this order is produced or not. No additional labour is being employed to meet this order. Therefore, this cost is a sunk cost, excluded from pricing.
- (c) Allocated Overhead Expenses: These expenses have been incurred at another Cost Centre, typical example would be office and administration costs. Such costs are fixed in nature that would be incurred irrespective of whether this order is produced or not. Therefore, this cost is a sunk cost, excluded from pricing.
- (d) Out of Pocket Expenses: These are expenses that are incurred to meet the production requirement of this order. These are additional variable expenses, that need to be included in pricing.
- (e) Other Material Costs: These are expenses that are incurred to meet the production requirement of this order. These are additional variable expenses, that need to be included in pricing.

(iii) Advice on Pricing Policy

Under perfect competition conditions, AB Compounds can have no pricing policy of its own, here sellers are price takers. It cannot increase its price beyond the current market price. The firm can only decide on the quantity to sell and continue to produce as long as the marginal cost is recovered. When marginal cost exceeds the selling price, the firm starts incurring a loss.

Since AB Compounds cannot control the selling price individually in the market, it can adopt the *going rate pricing* method. Here it can keep its selling price at the average level charged by the industry. This would yield a fair return to the firm. An average selling price would help the firm attract a *fair market share* in competitive conditions.

(b) (i) Revised budgeted hours

A learning curve is geometric with the general form $Y = ax^b$

Whereas—

Y = cumulative average time per unit or batch.

a = time taken to produce initial quantity.

x = the cumulative units of production or, if in batches, the cumulative number of batches

b = the learning index or coefficient

Time taken to paint 6th unit is **13.08 hours** i.e. (91.38 – 78.30) (See working note 1 & 2)

Time required to paint unit 6th onward = **13.08 hours** (because learning curve will cease post 6th unit)

Revised budgeted time required to paint 15 buses = **78.3 hours** (for first 5) + **13.08 hours × 10 units** (next 10 – 6th to 15th) = 78.3 hours + 130.8 hours = **209.10 hours**

Working note 1 - Time required for painting first 6 buses

$$Y = 20 \times (6)^{-0.152}$$

$$\text{Log } Y = \text{Log } 20 - 0.152 \times \text{Log } 6$$

$$\begin{aligned}
\text{Log } Y &= \text{Log } 20 - 0.152 \times \text{Log } (2 \times 3) \\
\text{Log } Y &= \text{Log } 20 - 0.152 \times (\text{Log } 2 + \text{Log } 3) \\
\text{Log } Y &= 1.3010 - 0.152 \times (0.3010 + 0.4771) \\
\text{Log } Y &= 1.3010 - 0.152 \times (0.7781) \\
\text{Log } Y &= 1.3010 - 0.1183 \\
\text{Log } Y &= 1.1827 \\
Y &= \text{antilog of } 1.1827 \\
Y &= 15.23 \text{ hours}
\end{aligned}$$

Time required for painting first 6 buses is 91.38 hours (15.23 hours × 6 buses)

Working note 2 - Time required for painting first 5 buses

$$\begin{aligned}
Y &= 20 \times (5)^{-0.152} \\
\text{Log } Y &= \text{Log } 20 - 0.152 \times \text{Log } 5 \\
\text{Log } Y &= 1.3010 - 0.152 \times (0.6990) \\
\text{Log } Y &= 1.3010 - 0.1062 \\
\text{Log } Y &= 1.1948 \\
Y &= \text{antilog of } 1.1948 \\
Y &= 15.66 \text{ hours}
\end{aligned}$$

Time required for painting first 5 buses is 78.3 hours (15.66 hours × 5 buses)

(ii) Control Ratios

- **Activity Ratio** measures the level of activity attained over a period by expressing number of standard hours required for actual production as percentage of the budgeted hours, as follows–

$$\frac{\text{Standard hours for actual production} \times 100}{\text{Budgeted hours}}$$

$$= (16,200 / 15,500) \times 100 = \mathbf{104.52\%}$$

104.52% signify that FMW is need to work 4.52% extra than what it budgeted for to manufacture what actually it manufactured.

- **Capacity Ratio** indicates the actual utilisation of budgeted hours. It is a measure which express actual working hour as percentage of budget hours (or maximum possible number of working hours).

$$\frac{\text{Actual working hours} \times 100}{\text{Budgeted Hours}}$$

$$= (15,000 / 15,500) \times 100 = \mathbf{96.77\%}$$

96.77% signify that FMW actually worked for 96.77 hours against every 100 possible hours.

Or Budgeted Capacity is utilised up to 96.77% and 3.23% capacity remains unutilised.

Note –

Instead of formula used above, **Capacity Usage Ratio** can also be measured using below mentioned formula–

$$\frac{\text{Actual hours worked} \times 100}{\text{Maximum possible working hours}}$$

- **Calendar Ratio** is a measure where actual number of working days are expressed as number of working days during budgeted period.

$$\frac{\text{Actual number of working days in a period} \times 100}{\text{Number of working days in related budgeted period}}$$

$$= (25/26) \times 100 = 96.15\%$$

- **Efficiency ratio** indicates the degree of efficiency attained in production. It is expressed in term of standard hours for actual production as a percentage of the actual hours spent in producing that work.

$$\frac{\text{Standard hours for actual production} \times 100}{\text{Actual hours worked}}$$

$$= (16,200 / 15,000) \times 100 = 108\%$$

108% signify that efficiency is 108% or task for which 108 hours is available finished in 100 hours.

Working Notes 1 - Calculation of standard hours for actual production

Sr. No.	Product	No. of Unit produced	No. of men hour required per unit	Total Standard Hours
1	Seat handle (B-SH-101)	1,200	6	7,200
2	Seat cover (B-SC-102)	750	12	9,000
Total standard hours for actual production				16,200

Working Notes 2 - Calculation of monthly budgeted hours

Annual budgeted hour = 1,86,000

Monthly budgeted hour = 1,86,000 hours / 12 months = 15,500

Working Notes 3 - Calculation of actual hours for actual production

Sr. No.	Particulars	Quantum in No.
1	No. of days production function worked	25
2	No. of hour in day	8
3	No. of worker in division	75
Total actual hours for month		15,000

Note – All calculations are on monthly basis.