## PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

## QUESTIONS

### Public Utility Service

1. A public company responsible for the supply of domestic gas has been approached by several prospective customers in a rural area adjacent to a high-pressure main. As a condition of its license to operate as a utility, the company is obliged to respond positively to current needs provided the financial viability of the company is not put at risk. New customers are charged ₹ 250 each for connection to the system.

   Once a meter is installed, a standing charge of ₹ 10 per quarter is billed. Charges for gas are levied at ₹ 400 per 1,000 metered units.

   A postal survey of the area containing, according to the rating authority, 5,000 domestic units, elicited a 40% response rate. 95% of those who responded confirmed that they wished to become gas users and expressed their willingness to pay the connection charge.

   Although it is recognized that a small percentage of those willing to pay for connection may not actually choose to use gas, it is expected that the average household will burn 50 metered units per month. There will be some seasonal differences.

   The company's marginal cost of capital is 17% pa and supplies of bulk gas cost the company ₹ 0.065 per metered unit. Wastage of 15% has to be allowed to determine what the maximum capital project cost can be to allow the company to provide the service required.

### Labour Related Decision

2. If DBC Ltd. is producing a component called 'DBC'. Estimated costs are:

| | Fixed Cost per year (₹ '000) | Variable Cost per 'DBC' (₹) |
|---|---|---|
| Production | 32,000 | 3,600 |
| Distribution | 2,000 | 200 |

   Direct labour costs are 40% of the variable production costs. In the production department machining and assembling of 'DBC', 90 men work 8 hours per day for 300 days in a year. Each worker can machine and assemble 1 'DBC' per uninterrupted 180 minutes time frame. In each 8 hours working day, 20 minutes are allowed for coffee-break, 30 minutes on an average for training and 22 minutes for supervisory instructions. Besides 10% of each day is booked as idle time to cover checking in and checking out changing operations, getting materials and other miscellaneous matters.

   DBC Ltd. has been facing industrial relations problem as the workers of company have a very strong union. Company is faced with the possibility of a strike by direct production workers engaged on the assembly of 'DBC'. The trade union is demanding an increase of

15%, back-dated from the beginning of financial year, but the company expects that if a strike does take place, it will last 25 Days after which the union will settle for an increase of 10% similarly back-dated. The only product of the company is being sold at ₹6,000.

If the strike takes place, Sales of 1,300 'DBC' would be lost. The balance that would ordinarily have been produced during the strike period could, however be sold, but these 'DBC' would have to be made up in overtime working which would be at an efficiency rate of 90% of normal. This would entail additional fixed cost of ₹1,00,000 and wage payments at time and one-half.

***Required***

Give necessary advice to the management to allow the strike to go ahead or to accept the union's demand.

**Just in Time**

3. Revolution Ltd. has entered into a contract to supply a component to a company which manufactures electronic equipments.

Expected demand for the component will be 70,000 units totally for all the periods. Expected sales and production cost will be

| Period | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Sales (units) | 9,500 | 17,000 | 18,500 | 25,000 |
| Variable cost per unit | 30 | 30 | 32.50 | 35 |

Total fixed overheads are expected to be ₹14 lakhs for all the periods.

The production manager has to decide about the production plan.

The choices are:

Plan 1:Produce at a constant rate of 17,500 units per period. Inventory holding costs will be ₹ 6.50 per unit of average inventory per period.

Plan 2: Use a just-in-Time (JIT) system

Maximum capacity per period normally 18,000 units

It can produce further up to 10,000 units per period in overtime.

Each unit produced in overtime would incur additional cost equal to 30% of the expected variable cost per unit of that period.

Assume zero opening inventory.

***Required***

(i) CALCULATE the incremental production cost and the savings in inventory holding cost by JIT production system.

(ii) ADVISE the company on the choice of a plan.

**CVP Analysis**

4. The profit for the year of Garena Ltd. works out to 12.5% of the capital employed and the relevant figures are as under:

| | |
|---|---|
| Sales | ₹5,00,000 |
| Direct Materials | ₹2,50,000 |
| Direct Labour | ₹1,00,000 |
| Variable Overheads | ₹40,000 |
| Capital Employed | ₹4,00,000 |

The new Sales Manager who has joined the company recently estimates for next year a profit of about 23% on capital employed, provided the volume of sales is increased by 10% and simultaneously there is an increase in Selling Price of 4% and an overall cost reduction in all the elements of cost by 2%.

***Required***

Find out by computing in detail the cost and profit for next year, whether the proposal of Sales Manager can be adopted.

**Profit Maximisation Model**

5. APV Ltd. has developed a new product which is about to be launched into the market. The variable cost of selling the product is ₹ 17 per unit. The marketing department has estimated that at a sale price of ₹ 25, annual demand would be 10,000 units. However, if the sale price is set above ₹ 25, sales demand would fall by 500 units for each ₹ 0.50 increase above ₹ 25. Similarly, if the price is below ₹ 25, demand would increase by 500 units for each ₹ 0.50 stepped reduction in price below ₹ 25.

***Required***

Determine the price which would maximise APV Ltd.'s profit in the next year.

**Return on Investment Pricing**

6. The cost of production and sales of 80,000 units per annum of product 'I' are:

| | | | |
|---|---|---|---|
| Material | ₹ 4,80,000 | Labour | ₹ 1,60,000 |
| Variable Overhead | ₹ 3,20,000 | Fixed overhead | ₹ 5,00,000 |

The fixed portion of capital employed is ₹12 lacs and the varying portion is 50% of sales turnover.

***Required***

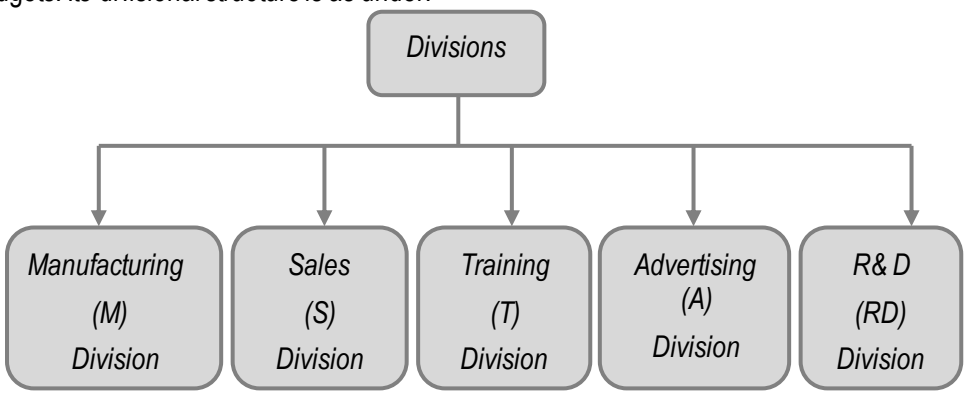
Determine the selling price per unit to earn a return of 12% net on capital employed (net of Tax @ 40%).

**Pricing Strategy**

7. State the appropriate pricing policy in each of the following independent situations:
   (i) 'W' is a new product for the company and the market and meant for large scale production and long term survival in the market. Demand is expected to be elastic.
   (ii) 'X' is a new product for the company, but not for the market. B's success is crucial for the company's survival in the long term.
   (iii) 'Y' is a new product to the company and the market. It has an inelastic market. There needs to be an assured profit to cover high initial costs and the usual sources of capital have uncertainties blocking them.
   (iv) 'Z' is a perishable item, with more than 80% of its shelf life over.

**Budget – Zero Based Budgeting**

8. Air Communication Limited is a state-owned large public company in the telecommunications sector. One of its main planning and control tools is the preparation and use of traditional annual budgets. Its divisional structure is as under:




Division T, A and RD incur substantial amount on discretionary expenses.

***Required***

Identify the possibilities of introducing a Zero Based Budgeting system for Division T, A and RD.

**Budget – Missing Figure**

9. Following information are extracted from monthly budgets of JIT Ltd.

| | November | December |
|---|---|---|
| Beginning WIP Inventory | 36,000 | ??? |
| Beginning Finished Goods Inventory | 44,000 | ??? |

| | | |
|---|---|---|
| Variable Cost of Goods Sold | 1,23,000 | ??? |
| Direct Material Usage | 50,000 | 56,000 |
| Direct Labour | 53,100 | 69,000 |
| Variable Overhead | 25,000 | 29,000 |
| Variable Cost of Goods Manufactured | 1,07,500 | 1,15,900 |
| Ending WIP Inventory | ??? | ??? |
| Ending Finished Goods Inventory | ??? | 45,000 |

***Required***

Find out missing figures.

**Standard Costing – Profit Reconciliation**

10. HKT Ltd. has provided the following summarized results for two years:

| | Year ended (₹ In lacs) | |
|---|---|---|
| | 31-03-2018 | 31-3-2019 |
| Sales | 3,000 | 3,277.50 |
| Material | 2,000 | 2,357.50 |
| Variable overheads | 500 | 525.00 |
| Fixed overheads | 300 | 367.50 |
| Profit | 200 | 27.50 |

During the year ended 31-3-2019 sale price has increased by 15% whereas material and overhead prices have increased by 15% and 5% respectively.

***Required***

(i) Analyse the variances of revenue and each element of cost over the year in order to bring out the reasons for the change in profit.

(ii) Present a profit reconciliation statement starting from profits in 2017-18 showing the factors responsible for the change in profits in 2018-19.

*Note – Consider 'Contribution Variances' for solving this question.*

**Transfer Pricing**

11. Great Southern Company Ltd. has two Divisions namely Casnub Bogie Division (CBD) and Wagon Division (WD). CBD manufactures Casnub Bogies and WD manufactures BOBN type of Wagons. To manufacture a Wagon WD needs four Casnub Bogies. CBD is the only manufacturer of the Casnub Bogies and supplies both WD and outside customers. Details of CBD and WD for the coming financial year 2019-20 are as follows:

| | CBD | WD |
|---|---|---|
| Fixed Costs (₹) | 9,20,20,000 | 16,45,36,000 |
| Variable Cost per unit (₹) | 2,20,000 | 4,80,000* |
| Capacity per month (units) | 320 | 12 |

** excluding transfer costs*

Market research has indicated that the demands in the market for Great Southern Company Ltd.'s products at different quotations are as follows-

For Casnub Bogies: Quotation price of ₹3,20,000 no tender will be awarded, but demand will increase by 30 Casnub Bogies with every ₹10,000 reduction in the unit quotation price below ₹3,20,000.

For Wagons: Quotation price of ₹17,10,000 no tender will be awarded, but the demand for Wagons will be increased by two Wagons with every ₹50,000 reduction in the unit quotation price below ₹17,10,000.

***Required***

(i) Calculate the unit quotation price of the Wagon that will maximise Great Southern Company Ltd.'s profit for the financial year 2019-20.

(ii) Calculate the unit quotation price of the Wagon that is likely to emerge if the divisional managers of CBD and WD both set quotation prices calculated to maximise divisional profit from sales to outside customers and the transfer price is set at market selling (quotation) price.

*[Note: If P = a – bQ then MR = a – 2bQ]*

**Linear Programming**

12. Find the dual problem for the following:

Minimize

$$Z = 2x_1 - 3x_2 + 4x_3$$

Subject to the constraints

$$\begin{aligned} 3x_1 + 2x_2 + 4x_3 &\geq 9 \\ 2x_1 + 3x_2 + 2x_3 &\geq 5 \\ 7x_1 - 2x_2 - 4x_3 &\leq 10 \\ 6x_1 - 3x_2 + 4x_3 &\geq 4 \\ 2x_1 + 5x_2 - 3x_3 &= 3 \\ x_1, x_2, x_3 &\geq 0 \end{aligned}$$

**Assignment Problem – Minimisation**

13. A factory is going to modify of a plant layout to install four new machines $X_1$, $X_2$, $X_3$ and $X_4$. There are 5 vacant places P, Q, R, S and T available. Because of limited space machine $X_2$ cannot be placed at R and $X_3$ cannot be placed at P. The cost of locating machine to place in Rupees is shown below:

(₹)

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 9 | 11 | 15 | 10 | 11 |
| $X_2$ | 12 | 9 | -- | 10 | 9 |
| $X_3$ | -- | 11 | 14 | 11 | 7 |
| $X_4$ | 14 | 8 | 12 | 7 | 8 |

***Required***

Determine the optimal assignment schedule in such a manner that the total costs are kept at a minimum.

**Missing Figures & Network**

14. The number of days of total float (TF), earliest start times (EST) and duration in days are given for some of the following activities.

| Activity | TF | EST | Duration |
|---|---|---|---|
| 1–2 | 0 | 0 | ??? |
| 1–3 | 2 | ??? | ??? |
| 1–4 | 5 | ??? | ??? |
| 2–4 | 0 | 4 | ??? |
| 2–5 | 1 | ??? | 5 |
| 3–6 | 2 | 12 | ??? |
| 4–6 | 0 | 12 | ??? |
| 5–7 | 1 | ??? | ??? |
| 6–7 | ??? | 23 | ??? |
| 6–8 | 2 | ??? | ??? |
| 7–8 | 0 | 23 | ??? |
| 8–9 | ??? | 30 | 6 |

***Required***

**(i)** Find the??? Figures.

**(ii)** Draw the network.

**(iii)** List the paths with their corresponding durations and state when the project can be completed.

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 |

16. West Wood Appliances Ltd. (WWAL) manufactures consumer durable products in a very highly competitive market. WWAL is considering launching a new product 'W-9' into the market and gathered the following data:

Expected Market Price- ₹ 5,000 per unit

Direct Material Cost- ₹ 1,850 per unit

Direct Labour Cost- ₹ 80 per hour

Variable Overhead Cost- ₹ 1,000 per unit

Packing Machine Cost (specially to be purchased for this product)- ₹5,00,000

WWAL expects the selling price for the new product will continue throughout the product's life and a total of 1,000 units can be sold over the entire lifetime of the product.

Direct labour costs are expected to reduce as the volume of output increases due to the effects of 80% learning curve (index is -0.3219). The expected time to be taken for the first unit is 30 hours and the learning effect is expected to end after 250 units have been produced. Units produced after first 250 units will take the same time as the 250th unit.

***Required***

(i) Calculate the expected total labour hours over the life time of the product 'W-9'.

(ii) Profitability of product 'W-9' that WWAL will earn over the life time of the product.

(iii) Average target labour cost per unit over the life time of the product if WWAL requires average profit of ₹ 800 per unit, to achieve its long term objectives.

Note: $250^{-0.3219} = 0.1691$, $249^{-0.3219} = 0.1693$

**Miscellaneous**

17. Indicate 6 activity drivers in respect of each of the following activity cost pools:

(i) Human Resources Cost

(ii) Accounting Costs

## SUGGESTED ANSWERS/HINTS

**1. Working Notes**

**1.** No. of Customer = 1,900 (5,000 × 40% × 95%)

**2.** Consumption of Gas = 11,40,000 Metered units (1,900 × 50 mt.× 12 months)

Gas Supply = 13,41,176 Metered units {11,40,000 × (100 ÷ 85)}

**3.** Cash Inflow

| | (₹) |
|---|---|
| Rent (1,900 × 4 Quarters × ₹ 10) | 76,000 |
| *Add:* Consumption Charge (11,40,000 × ₹ 0.4) | 4,56,000 |
| *Less:* Cost of Company (13,41,176 × ₹ 0.065) | 87,176 |
| Cash Inflow p.a. | 4,44,824 |

One Time Connection Charge = ₹ 4,75,000 (₹ 250 × 1,900 customers)

**Maximum Capital Project Cost Can be to Allow the Company to Provide the**

**Service Required**

By Following the Concept of Perpetuity

(Investment − ₹ 4,75,000) × 17% = ₹ 4,44,824

∴ Investment = ₹ 30,91,612

**2. Alternative-1 with No Strike:** (Refer W.N.-2, 3)

Cost of Settlement is 15% Increase i.e. ₹216 per unit

Annual Cost of Settlement

= 54,000 units × ₹216

= ₹1,16,64,000

**Alternative 2 i.e. if Strike Goes Ahead:** (Refer W.N.-1, 2, 3)

| **Extra Cost** | **(₹)** |
|---|---|
| Annual Incremental Labour Cost (Ex. Strike Days Production) [{54,000 units – (25 Days × 180 units per Day)} × ₹144.00] | 71,28,000 |
| Loss of Contribution *due to loss of sales* [1,300 units × ₹ 2,200] | 28,60,000 |
| Incremental Labour Cost for Balance 3,200 units [(25 Days × 180 units per Day) – 1,300 units} × ₹144.00] | 4,60,800 |
| Overtime Premium [3,200 units × 1,584 × 0.5] | 25,34,400 |
| Payment for Efficiency [3,200 units × 1/9 × 1,584 × 1.5] | 8,44,800 |
| Additional Fixed Cost | 1,00,000 |
| | 1,39,28,000 |

If there is no strike, it will yield a financial benefit of ₹ 22,64,000 (₹1,39,28,000 – ₹ 1,16,64,000). Management should accept union's demand.

**Working Note**

**(1) Statement Showing Contribution *per unit* of 'DBC'**

| | **(₹)** |
|---|---|
| Selling Price | 6,000 |
| *Less:* Variable Costs: | |
| Labour Cost | 1,440 |
| Production Ex. Wages (₹3,600 – ₹1,440) | 2,160 |
| Distribution | 200 |
| Contribution | 2,200 |

**(2) Calculation of Labour Cost**

| | | |
|---|---|---|
| Direct Labour (40% of production costs of ₹3,600) | = | ₹1,440 *per unit* |
| With 15% Increase, Revised Labour Cost (₹1,440 + ₹216) | = | ₹1,656 |
| With 10% Increase, Revised Labour Cost (₹1,440 + ₹144) | = | ₹1,584 |

**(3) Statement Showing Budgeted Production**

| | | |
|---|---|---|
| Total Time in a Day: (8hrs. × 60 minutes) | = | 480 minutes |
| *Less:* Idle Time | = | 48 minutes |
| Coffee Break | = | 20 minutes |
| Instructions | = | 22 minutes |
| Training | = | 30minutes |
| Productive Time *per day* | = | 360 minutes |

Therefore, 'DBC' to be produced per man per day: (360/180 × 1)

= 2 units

Since 'DBC' are produced at the rate of 2 'DBC' per man day, so total yearly production will be 54,000 units (2 units × 90 men × 300 days) of 'DBC'

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This problem has been solved by comparing **'Existing Situation'** with both **'Alternatives (Strike or Non-Strike)'** *independently*. However this problem can also be solved by comparing **'Alternatives (Strike or Non-Strike)'** *only* and final answer would be the same. Students may also solve this problem by taking **'Total Approach'** instead of **'Incremental Approach'**.

**3. (i) Workings**

**Statement Showing 'Inventory Holding Cost' under Plan 1**

| Particulars | | Pd. 1 | Pd. 2 | Pd. 3 | Pd.4 |
|---|---|---|---|---|---|
| Opening Inventory | (A) | --- | 8,000 | 8,500 | 7,500 |
| *Add:* Production | | 17,500 | 17,500 | 17,500 | 17,500 |
| *Less:* Demand/ Sales | | 9,500 | 17,000 | 18,500 | 25,000 |
| Closing Inventory | (B) | 8,000 | 8,500 | 7,500 | --- |
| Average Inventory $\left(\frac{A+B}{2}\right)$ | | 4,000 | 8,250 | 8,000 | 3,750 |
| Inventory Holding Cost @ ₹6.50 | | 26,000 | 53,625 | 52,000 | 24,375 |

Inventory Holding Cost *for the four periods* = ₹1,56,000

(₹26,000+₹53,625+₹52,000+₹24,375)

**Statement Showing 'Additional Cost-Overtime' under Plan 2 (JIT System)**

| Particulars | Pd. 1 | Pd. 2 | Pd. 3 | Pd.4 |
|---|---|---|---|---|
| Demand/ Sales | 9,500 | 17,000 | 18,500 | 25,000 |
| Production in Normal Time | 9,500 | 17,000 | 18,000 | 18,000 |
| Production in Over Time (A) | --- | --- | 500 | 7,000 |
| Variable Cost *per unit* | 30.00 | 30.00 | 32.50 | 35.00 |
| Additional Cost – Overtime *per unit* (B) (@ 30% of Variable Cost) | 9.00 | 9.00 | 9.75 | 10.50 |
| Additional Cost – Overtime (A) × (B) | --- | --- | 4,875 | 73,500 |

Total Additional Payment (Overtime) = ₹78,375

(₹4,875 + ₹73,500)

**Statement Showing 'Additional Variable Cost*' under Plan 2 (JIT System)**

| Particulars | Pd. 1 | Pd. 2 | Pd. 3 | Pd.4 | Total |
|---|---|---|---|---|---|
| Production (Plan 1) | 17,500 | 17,500 | 17,500 | 17,500 | 70,000 |
| Variable Cost ...(A) | 5,25,000 | 5,25,000 | 5,68,750 | 6,12,500 | 22,31,250 |
| Production (Plan 2, JIT) | 9,500 | 17,000 | 18,500 | 25,000 | 70,000 |
| Variable Cost (B) | 2,85,000 | 5,10,000 | 6,01,250 | 8,75,000 | 22,71,250 |
| Total | | | | (B) – (A) | 40,000 |

* *excluding overtime cost*

Incremental Production Cost in JIT System = ₹78,375 + ₹40,000

= ₹1,18,375

Therefore, Saving in JIT System (Net) = ₹1,56,000 – ₹1,18,375

= ₹37,625

**(ii) Advice**

Though Revolution Ltd is saving ₹37,625 by changing its production system to Just-in-time but it has to consider *other factors* as well before taking any final call which are as follows:-

— Revolution Ltd has to ensure that it receives materials from its suppliers on the exact date and at the exact time when they are needed. Credentials and reliability of supplier must be thoroughly checked.

- To remove any quality issues, the engineering staff must visit supplier's sites and examine their processes, not only to see if they can reliably ship high-quality parts but also to provide them with engineering assistance to bring them up to a higher standard of product.
- Revolution Ltd should also aim to improve quality at its process and design levels with the purpose of achieving "Zero Defects" in the production process.
- Revolution Ltd should also keep in mind the efficiency of its work force. Revolution Ltd must ensure that labour's learning curve has reached at steady rate so that they are capable of performing a variety of operations at effective and efficient manner. The workforce must be completely retrained and focused on a wide range of activities.

**4. Statement Showing "Cost and Profit for the Next Year"**

| Particulars | Existing Volume, etc. | Volume, Costs, etc. after 10% Increase | Estimated Sale, Cost, Profit, etc.* |
|---|---|---|---|
| | (₹) | (₹) | (₹) |
| Sale | 5,00,000 | 5,50,000 | 5,72,000 |
| *Less:* Direct Materials | 2,50,000 | 2,75,000 | 2,69,500 |
| Direct Labour | 1,00,000 | 1,10,000 | 1,07,800 |
| Variable Overheads | 40,000 | 44,000 | 43,120 |
| Contribution | 1,10,000 | 1,21,000 | 1,51,580 |
| *Less:* Fixed Cost# | 60,000 | 60,000 | 58,800 |
| Profit | 50,000 | 61,000 | 92,780 |

**(*)** for the next year after increase in selling price @ 4% and overall cost reduction by 2%.

**(#)** Fixed Cost = Existing Sales – Existing Marginal Cost – 12.5% on ₹4,00,000

= ₹5,00,000 – ₹3,90,000 – ₹50,000

= ₹60,000

Percentage Profit on Capital Employed equals to 23.19% $\left(\frac{₹92,780}{₹4,00,000} \times 100\right)$

Since the Profit of ₹92,780 is more than 23% of capital employed, the proposal of the Sales Manager can be adopted.

**5.** **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) |
| 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 |
| 25.50 | 17.00 | 8.50 | 9,500 | 80,750 |
| **26.00** | **17.00** | **9.00** | **9,000** | **81,000** |
| 26.50 | 17.00 | 9.50 | 8,500 | 80,750 |
| 27.00 | 17.00 | 10.00 | 8,000 | 80,000 |
| 27.50 | 17.00 | 10.50 | 7,500 | 78,750 |

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.

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This problem can also be solve by using **'Profit Maximisation'** model formula.

**6.** Return of 12% Net (after tax of 40%) on Capital Employed is equivalent to 20% (Gross) [12% ÷ (1 – 0.4)] on Capital Employed.

Let Selling Price per unit to be 'K'

Since Total Sales = Total Cost + Profit

80,000 K = 14,60,000 + 20% (12,00,000 + 0.5 × 80,000K)

Or, 80,000 K = 14,60,000 + 2,40,000 + 8,000K

Or, 72,000 K = 17,00,000

Or, 'K' = $\frac{17,00,000}{72,000}$

= ₹23.61

Hence Selling Price per unit will be ₹23.61.

**7.**

| | Situation | Appropriate Pricing Policy |
|---|---|---|
| (i) | 'W' is a new product for the company and the market and meant for large scale production and long term survival in the market. Demand is expected to be elastic. | Penetration Pricing |
| (ii) | 'X' is a new product for the company, but not for the market. X's success is crucial for the company's survival in the long term. | Market Price or Price Just Below Market Price |
| (iii) | 'Y' is a new product to the company and the market. It has an inelastic market. There needs to be an assured profit to cover high initial costs and the unusual sources of capital have uncertainties blocking them. | Skimming Pricing |
| (iv) | 'Z' is a perishable item, with more than 80% of its shelf life over. | Any Cash Realizable Value* |

*(*) this amount decreases every passing day.*

**8.** Discretionary costs are those that are incurred, typically each year, in an amount that is approved as part of the normal budget process. However, there is no clear relationship between the volume of services and the amount of cost that must be incurred. Manager must decide and justify the level that is deemed to be appropriate. This justification is to be made a fresh without making reference to previous level of spending in his/her department.

Zero based budgeting is undoubtedly most effective in terms of discretionary costs. The bottom line of a zero based budgeting is that it is important to understand what types of objectives are being accomplished by discretionary cost centers and what resources being devoted to accomplishing various objectives. This will allows a prioritization, so that organization can evaluate the likely impact of substantial increase or decrease in the resources allocated to the discretionary center.

Accordingly, ZBB has extensive potential application to the division T, A and RD.

**9. Analysis of WIP Account**

| | November | December |
|---|---|---|
| Opening WIP | 36,000 | **56,600** |
| *Add:* Direct Materials Usage | 50,000 | 56,000 |
| *Add:* Direct Labor | 53,100 | 69,000 |
| *Add:* Variable Overhead | 25,000 | 29,000 |

| | | |
|---|---|---|
| Total Inflow into WIP | 1,64,100 | 2,10,600 |
| *Less:* Variable Cost of Goods Manufactured | 1,07,500 | 1,15,900 |
| Ending WIP | **56,600** | **94,700** |

**Analysis of Finished Goods Inventory Account**

| | November | December |
|---|---|---|
| Opening Finished Goods | 44,000 | **28,500** |
| *Add:* Cost of Goods Manufactured | 1,07,500 | 1,15,900 |
| Cost of Goods Available for Sale | 1,51,500 | 1,44,400 |
| *Less:* Cost of Goods Sold | 1,23,000 | **99,400** |
| Ending Finished Goods Inventory | **28,500** | 45,000 |

**10. Statement Showing Reconciliation Between Budgeted [F.Y. 2017-18] & Actual Profit [F.Y. 2018-19]**

| Particulars | (₹ in lacs) | (₹ in lacs) |
|---|---|---|
| Budgeted Profit | | 200.00 |
| Sales Contribution Variances: | | |
| Price | 427.50 (F) | |
| Volume | 25 (A) | 402.50 (F) |
| Direct Material Variances: | | |
| Price | 307.50 (A) | |
| Usage | 150.00 (A) | 457.50 (A) |
| Variable Overheads Variances: | | |
| Expenditure | 25.00 (A) | |
| Efficiency | 25.00 (A) | 50.00 (A) |
| Fixed Overheads Variances: | | |
| Expenditure | 67.50 (A) | |
| Volume | N.A. | 67.50 (A) |
| Actual Profit | | 27.50 |

**Computation of Variances (₹ In Lacs)**

**Sales Variances (W.N.1)**

**Price Variance** = Actual Sales – Standard Sales

= ₹ 3,277.50 – ₹ 2,850.00

= ₹ 427.50 (F)

**Volume Variance** = Standard Sales – Budgeted Sales

= ₹ 2,850.00 – ₹ 3,000.00

= ₹ 150 (A)

**Sales Contribution Variances**

**Sales Contribution Price Variance** = Sales Price Variance

= ₹ 427.50 (F)

**Sales Contribution Volume Variance** = Sales Volume Variance × Budgeted PV Ratio

$$= ₹\ 150\ (A) \times \left( \frac{₹\ 200 + ₹\ 300}{₹\ 3,000} \right)$$

= ₹ 25 (A)

**Material Variances (W.N.2)**

**Material Price Variance**

= Standard Cost of Actual Quantity – Actual Cost

= ₹ 2,050.00 – ₹ 2,357.50

= ₹ 307.50 (A)

**Material Usage Variance**

= Standard Cost of Standard Quantity for Actual Output – Standard Cost of Actual Quantity

= ₹ 1,900 – ₹ 2,050

= ₹ 150 (A)

**Variable Overhead Variances (W.N.3)**

**Expenditure Variance**

= Budgeted Variable Overheads for Actual Hours – Actual Variable Overheads

*Or*

= Std. Rate *per unit* × Expected Output for Actual Hours Worked – Actual Variable Overheads

= ₹ 500 – ₹ 525

= ₹ 25 (A)

**Efficiency Variances** = Standard Variable Overheads for Production – Budgeted Variable Overheads for Actual Hours

*Or*

= Std. Rate *per unit* × Actual Output – Std. Rate *per unit* × Expected Output for Actual Hours Worked

= ₹ 475 – ₹ 500

= ₹ 25 (A)

**Fixed Overhead Variances (W.N.4)**

**Expenditure Variance**

= Budgeted Fixed Overheads – Actual Fixed Overheads.

= ₹ 300.00 – ₹ 367.50

= ₹ 67.50 (A)

**Working Notes (₹ in lacs)**

**Note-1:**

| | |
|---|---|
| Sales in F.Y. 2018-2019 | 3,277.50 |
| *Less:* Increase due to *price rise* [₹ 3,277.50 lacs x 15/115] | 427.50 |
| Sales in F.Y. 2018-2019 at F.Y. 2017-2018 Prices **[Standard Sales]** | 2,850.00 |
| Sales in F.Y. 2017-2018 | 3,000.00 |
| Fall in Sales in F.Y. 2018-2019 [₹ 3,000 lacs - ₹ 2,850 lacs] | 150.00 |
| Percentage fall | 5% |

**Note-2:**

| | |
|---|---|
| Material Cost in F.Y. 2017-2018 | 2,000.00 |
| *Less:* 5% for Decrease in Volume | 100.00 |
| 'Standard Material Usage' at F.Y. 2017-18 Prices **(Standard Cost of Standard Quantity for Actual output)** | 1,900.00 |
| Actual Material Cost F.Y. 2018-2019 | 2,357.50 |
| *Less:* 15% Increase in Prices [₹ 2,357.50 lakhs x 15/115] | 307.50 |
| Actual Materials Used, at F.Y. 2017-2018 Prices **(Standard Cost of Actual Quantity)** | 2,050.00 |

**Note-3:**

| | |
|---|---|
| Variable Overheads Cost in F.Y. 2017-18 | 500.00 |
| *Less:* 5% due to fall in Volume of Sales in F.Y. 2018-19 | 25.00 |
| **"Standard Overheads for Production"** in F.Y. 2018-19 | 475.00 |
| Actual Variable Overheads Incurred in F.Y. 2018-19 | 525.00 |
| *Less:* 5% for Increase in Price [₹ 525 lacs x 5 / 105] | 25.00 |
| Amount Spent in F.Y. 2018-19 at F.Y. 2017-18 Prices **(Budgeted Variable Overheads for Actual Hours)** | 500.00 |

**11. (i)** Assumed Quotation Price 'P', Quantity 'Q'

The Marginal Cost of a 'Wagon' is ₹13,60,000

(₹2,20,000 × 4 Casnub Bogies + ₹4,80,000)

*Demand Function* for a 'Wagon'

| | | |
|---|---|---|
| P | = | ₹17,10,000 – (₹50,000 / 2) × Q |
| Revenue (R) | = | Q × [17,10,000 – 25,000 × Q] |
| | = | 17,10,000 Q – 25,000 $Q^2$ |
| Marginal Revenue (MR) | = | 17,10,000 – 50,000 Q |
| Marginal Cost (MC) | = | 13,60,000 |

*Profit is Maximum where Marginal Revenue (MR) equals to Marginal Cost (MC)*

| | | |
|---|---|---|
| 17,10,000 – 50,000 Q | = | 13,60,000 |
| Q | = | 7.00 units |

By putting the value of 'Q' in *Demand Function*, value of 'P' is obtained.

| | | |
|---|---|---|
| P | = | 17,10,000 – (50,000/ 2) × Q |
| | = | 17,10,000 – 25,000 × 7.00 |
| | = | ₹15,35,000 |

At ₹15,35,000 unit Quotation Price of a Wagon the Great Southern Company Ltd.'s Profit will be Maximum.

**(ii)** At CBD the Divisional Manager would ensure that Divisional Marginal Revenue should be ***equal to*** Division's Marginal Cost so that Profit can be Maximum.

| | | |
|---|---|---|
| MR of a Casnub Bogies | = | MC of Manufacturing a Casnub Bogies |
| 3,20,000 – 2(10,000/ 30) × Q | = | 2,20,000 |
| Q | = | 150 units |

Selling Price of a Casnub Bogie 'P' is

P = 3,20,000 – (10,000/ 30) × 150

= ₹2,70,000

CBD will earn Maximum Profit when it will Quote ₹2,70,000 to the Outside Market. Since, Outside Market Quotation is *Transfer Price* as well, so Transfer Price to WD will be ₹2,70,000 and it forms part of WD's Marginal Cost.

At WD, Division Manager would ensure that Divisional Marginal Revenue should be ***equal to*** Division's Marginal Cost so that Profit can be Maximum.

MR of a Wagon = MC of Manufacturing a Wagon

17,10,000 – 50,000 × Q = (₹2,70,000 × 4 Casnub Bogies) + ₹4,80,000

Q = 3.00 units

Quotation Price of a Wagon 'P' should be:

P = ₹17,10,000 – 25,000 × 3.00

= ₹16,35,000

The unit Quotation Price of Wagon that emerges as a result of Market Based Transfer Pricing is ₹16,35,000.

**12.** Primal

Minimize $Z = 2x_1 - 3x_2 + 4x_3$

Subject to the constraints

$$3x_1 + 2x_2 + 4x_3 \geq 9$$

$$2x_1 + 3x_2 + 2x_3 \geq 5$$

$$-7x_1 + 2x_2 + 4x_3 \geq -10$$

$$6x_1 - 3x_2 + 4x_3 \geq 4$$

$$2x_1 + 5x_2 - 3x_3 \geq 3$$

$$-2x_1 - 5x_2 + 3x_3 \geq -3$$

$$x_1, x_2, x_3 \geq 0$$

Dual

Maximize $Z = 9y_1 + 5y_2 - 10y_3 + 4y_4 + 3y_5 - 3y_6$

Subject to constraints

$$3y_1 + 2y_2 - 7y_3 + 6y_4 + 2y_5 - 2y_6 \leq 2$$

$$2y_1 + 3y_2 + 2y_3 - 3y_4 + 5y_5 - 5y_6 \leq -3$$

$$4y_1 + 2y_2 + 4y_3 + 4y_4 - 3y_5 + 3y_6 \leq 4$$

$$y_1, y_2, y_3, y_4, y_5, y_6 \geq 0$$

By substituting $y_5 - y_6 = y_7$ the dual can alternatively be expressed as:

Maximize $Z = 9y_1 + 5y_2 - 10y_3 + 4y_4 + 3y_7$

Subject to constraints

$$3y_1 + 2y_2 - 7y_3 + 6y_4 + 2y_7 \leq 2$$

$$-2y_1 - 3y_2 - 2y_3 + 3y_4 - 5y_7 \geq 3$$

$$4y_1 + 2y_2 + 4y_3 + 4y_4 - 3y_7 \leq 4$$

$y_1, y_2, y_3, y_4 \geq 0$, $y_7$ unrestricted in sign.

**13.** Dummy machine ($X_5$) is inserted to make it a balanced cost matrix and assume its installation cost to be zero. Cost of install at cell $X_3$ (P) and $X_2$ (R) is very high marked as M.

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 9 | 11 | 15 | 10 | 11 |
| $X_2$ | 12 | 9 | M | 10 | 9 |
| $X_3$ | M | 11 | 14 | 11 | 7 |
| $X_4$ | 14 | 8 | 12 | 7 | 8 |
| $X_5$ (Dummy) | 0 | 0 | 0 | 0 | 0 |

**Step 1**

Subtract the minimum element of each row from each element of that row-

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 0 | 2 | 6 | 1 | 2 |
| $X_2$ | 3 | 0 | M | 1 | 0 |
| $X_3$ | M | 4 | 7 | 4 | 0 |
| $X_4$ | 7 | 1 | 5 | 0 | 1 |
| $X_5$ (Dummy) | 0 | 0 | 0 | 0 | 0 |

**Step 2**

Subtract the minimum element of each column from each element of that column-

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 0 | 2 | 6 | 1 | 2 |
| $X_2$ | 3 | 0 | M | 1 | 0 |
| $X_3$ | M | 4 | 7 | 4 | 0 |
| $X_4$ | 7 | 1 | 5 | 0 | 1 |
| $X_5$ (Dummy) | 0 | 0 | 0 | 0 | 0 |

**Step 3**

Draw lines to connect the zeros as under-

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 0 | 2 | 6 | 1 | 2 |
| $X_2$ | 3 | 0 | M | 1 | 0 |
| $X_3$ | M | 4 | 7 | 4 | 0 |
| $X_4$ | 7 | 1 | 5 | 0 | 1 |
| $X_5$ (Dummy) | 0 | 0 | 0 | 0 | 0 |

There are five lines which are equal to the order of the matrix. Hence the solution is optimal. We may proceed to make the assignment as under-

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 0 | 2 | 6 | 1 | 2 |
| $X_2$ | 3 | 0 | M | 1 | 0 |
| $X_3$ | M | 4 | 7 | 4 | 0 |
| $X_4$ | 7 | 1 | 5 | 0 | 1 |
| $X_5$ (Dummy) | 0 | 0 | 0 | 0 | 0 |

The following is the assignment which keeps the total cost at minimum-

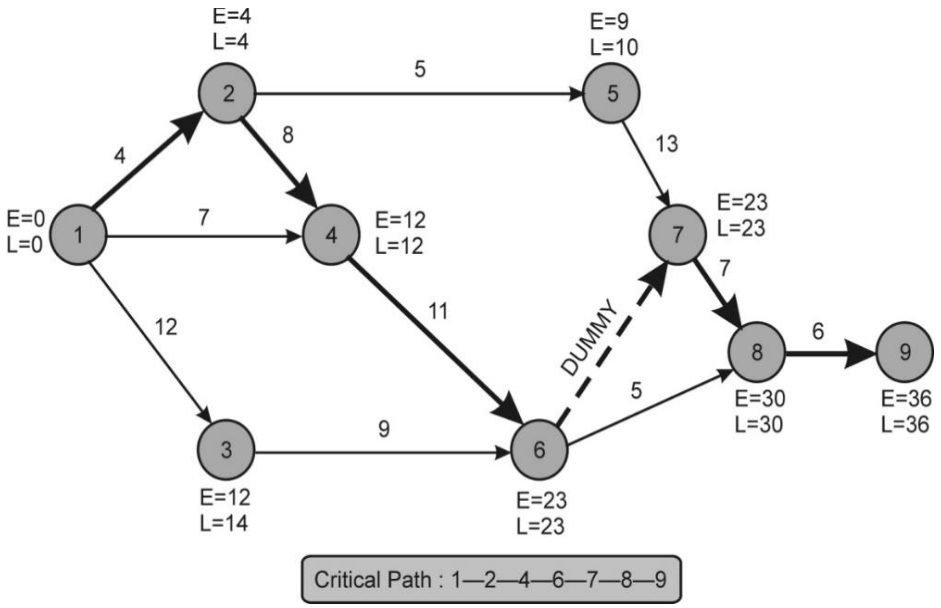
| Machines | Location | Costs (₹) |
|---|---|---|
| $X_1$ | P | 9 |
| $X_2$ | Q | 9 |
| $X_3$ | T | 7 |

| | | |
|---|---|---|
| $X_4$ | S | 7 |
| $X_5$ (Dummy) | R | 0 |
| | Total | 32 |

**14. (i)** Calculation of **Missing Figures**:

| Activity | Duration | EST | EFT | LST | LFT | Total Float |
|---|---|---|---|---|---|---|
| | $D_{ij}$ | $E_i$ | $E_i + D_{ij}$ | $L_j - D_{ij}$ | $L_j$ | LST− EST |
| 1–2 | 4 | 0 | 4 | 0 | 4 | 0 |
| 1–3 | 12 | 0 | 12 | 2 | 14 | 2 |
| 1–4 | 7 | 0 | 7 | 5 | 12 | 5 |
| 2–4 | 8 | 4 | 12 | 4 | 12 | 0 |
| 2–5 | 5 | 4 | 9 | 5 | 10 | 1 |
| 3–6 | 9 | 12 | 21 | 14 | 23 | 2 |
| 4–6 | 11 | 12 | 23 | 12 | 23 | 0 |
| 5–7 | 13 | 9 | 22 | 10 | 23 | 1 |
| 6–7 | 0 | 23 | 23 | 23 | 23 | 0 |
| 6–8 | 5 | 23 | 28 | 25 | 30 | 2 |
| 7–8 | 7 | 23 | 30 | 23 | 30 | 0 |
| 8–9 | 6 | 30 | 36 | 30 | 36 | 0 |

**(ii)** The **Network** for the given problem:



**(iii)** The **Various Paths** in the Network are:

1–2–4–6–7–8–9 with Duration 36 Days

1–2–5–7–8–9 with Duration 35 Days

1–3–6–7–8–9 with Duration 34 Days

1–2–4–6–8–9 with Duration 34 Days

1–3–6–8–9 with Duration 32 Days

1–4–6–7–8–9 with Duration 31 Days

1–4–6–8–9 with Duration 29 Days

**(iv)** The **Critical Path** is 1–2–4–6–7–8–9 with Duration 36 Days.

**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. Calculation of Total Labour Hours Over the Life Time of The Product 'W-9'**

*The average time per unit for 250 units*

$Y_x = ax^b$

*Or,* $Y_{250} = 30 \times 250^{-0.3219}$

*Or,* $Y_{250} = 30 \times 0.1691$

*Or,* $Y_{250} = 5.073$ hours

Total time for 250 units = 5.073 × 250 units

= 1,268.25 hours

*The average time per unit for 249 units*

$Y_{249} = 30 \times 249^{-0.3219}$

*Or,* $Y_{249} = 30 \times 0.1693$

*Or,* $Y_{249} = 5.079$ hours

Total time for 249 units = 5.079 × 249 units

= 1,264.67 hours

*Time for 250th unit* = 1,268.25 hours – 1,264.67 hours

= 3.58 hours

*Total Time for 1,000 units* = (750 × 3.58 hours) + 1,268.25 hours

= 3,953.25 hours

**Profitability of the Product 'W-9'**

*Sales 1,000 Units*

| Particulars | Amount (₹) |
|---|---|
| Sales | 50,00,000 |
| *Less:* Direct Material | 18,50,000 |
| Direct Labour (3,953.25 hours × ₹ 80) | 3,16,260 |
| Variable Overheads (1,000 units× ₹ 1,000) | 10,00,000 |
| Contribution | 18,33,740 |
| *Less:* Packing Machine Cost | 5,00,000 |
| Profit | 13,33,740 |

**Average Target Labour Cost *per unit***

| Particulars | Amount (₹) |
|---|---|
| Expected Sales Value | 50,00,000 |
| *Less:* Desired Profit (1,000 units × ₹ 800) | 8,00,000 |
| Target Cost | 42,00,000 |
| *Less:* Direct Material (1,000 units × ₹ 1,850) | 18,50,000 |
| Variable Cost (1,000 units × ₹ 1,000) | 10,00,000 |
| Packing Machine Cost | 5,00,000 |
| Target Labour Cost | 8,50,000 |
| Average Target Labour Cost *per unit* (₹ 8,50,000 ÷ 1,000 units) | 850 |

**17. (i)**

| | |
|---|---|
| Human Resource Cost | 1. Number of employee |
| | 2. Number of training Hours |
| | 3. Number of benefit changes |
| | 4. Number of insurance claims |
| | 5. Number of pension changes |
| | 6. Number of recruiting contacts |

**(ii)**

| | |
|---|---|
| Accounting Cost | 1. Number of billings |
| | 2. Number of cash receipts |
| | 3. Number of check payments |
| | 4. Number of general ledger entries |
| | 5. Number of reports issued |
| | 6. Number of responsibility centre |

## PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

## QUESTIONS

### Limiting Factor

1. List out the basis for deciding the priority of selecting the best product in the different circumstances stated below:

   (i) When maximum sales (in value) is a limiting factor.

   (ii) 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)

2. 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 | |
| $D_4$ | 1,00,000 | 14,00,000 |
| General fixed overheads | | 6,20,000 |
| | | 31,00,000 |

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***

(i) Prepare a profitability statement that is more useful for decision making than the profit statement prepared by DRB Ltd.

(ii) Calculate the break-even volume in batches and also in approximate units for Product '$D_1$'.

**Flexible Budget**

3. XEH Ltd. Had prepared fixed and flexible budget for the financial year 2017-18 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 2017-18, 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**

4. The following information is given about the type of defects during a production period and the frequencies of their occurrence in a spectacle manufacturing company:

| Defect | No. of items |
|---|---|
| End Frame not equidistant from the centre | 10 |
| Non-uniform grinding of lenses | 60 |
| Power mismatches | 20 |
| Scratches on the surface | 110 |
| Spots / Stains on lenses | 5 |
| Rough edges of lenses | 70 |
| Frame colours-shade differences | 25 |

***Required***

Construct a frequency table so that a Pareto Chart can be constructed for the defect type. Which areas should the company focus on?

**Standard Costing**

5. Sapporo Manufacturing Co. (SMC) is a leading consumer goods company. The budgeted and actual data of SMC for the year 2017-18 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 2017-18 in as much detail as possible.

**Decision Making**

6. A company manufactures three components, A, B and C. these components pass through machines P and Q. The machine hour capacity of Q is limited to 7,800 hours a month. The

company is interested in fulfilling the market demand to retain its market share. The following information is given:

| | | A | B | C |
|---|---|---|---|---|
| Demand (units/ month) | | 1,200 | 1,200 | 1,500 |
| Variable cost (₹ / unit) | | 187 | 215 | 111 |
| Fixed cost (₹/ unit) (at normal capacity utilization) | | 115 | 115 | 55 |
| Hours per unit | P | 2 | 2 | 1½ |
| | Q | 3 | 3 | 1 |

Component B has to be made by the company. There is a supplier available for components A and C at ₹ 280 and ₹ 161 per unit respectively.

***Required***

(i) Which component(s) and in what quantities should be purchased to minimize costs?

(ii) From a financial perspective, what do you need to ensure in order to justify your answer in (i) above?

**Cost Plus Pricing**

7. The budgeted cost data of a product manufactured by XYZ Co. Ltd. is furnished as below:

| | |
|---|---|
| Budgeted units to be produced | 2,00,000 |
| Variable cost (₹) | 32 per unit |
| Fixed cost (₹) | 16 lacs |

It is proposed to adopt cost plus pricing approach with a mark-up of 25% on full budgeted cost basis.

However, research by the marketing department indicates that demand of the product in the market is price sensitive. The likely market responses are as follows:

| Selling price (₹ per unit) | 44 | 48 | 50 | 56 | 60 |
|---|---|---|---|---|---|
| Annual Demand (units) | 1,68,000 | 1,52,000 | 1,40,000 | 1,28,000 | 1,08,000 |

***Required***

Analyse the above situation and determine the best course of action.

**Transfer Pricing**

8. 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**

9. 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**

10. 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**

11. State the Validity of following statements along with the reasons:

(i) Two activities have common predecessor and successor activities. So, they can have common initial and final nodes.

(ii) In respect of any activity whether real or dummy, the terminal node should bear a number higher than the initial node number.

(iii) The difference between the latest event time and the earliest event time is termed as free float.

(iv) 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.

(v) 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**

12. 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**

13. 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 $4^{th}$ 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

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

14. State whether the learning curve theory can be applied to the following independent situations briefly justifying your decision:

    (i) A labour intensive sculpted product is carved from the metal provided to the staff. The metal is sourced from different suppliers since it is scarce. The alloy composition of the input metal is quite different among the suppliers.

    (ii) Pieces of hand-made furniture are assembled by the company in a far off location. The labourers do not know anything about the final product which utilizes their work. As a matter of further precaution, rotation of labour is done frequently.

    (iii) Skilled workers have been employed for a long time. The company has adequate market for the craft pieces done by these experts.

    (iv) A company funds that it always has an adverse usage of indirect material. It wants to apply learning curve theory to improve the way standards have been set.

**Target Costing**

15. A toy company 'T' expects to successfully launch Toy Z based on a film character. T must pay 15% royalty on the selling price to the film company. 'T' targets a selling price of ₹ 100 per toy and profit of 25% selling price.

    The following are the cost data forecast:

| | ₹/toy |
|---|---|
| Component A | 8.50 |
| Component B | 7.00 |
| Labour: 0.4 hr. @ ₹ 60 per hr | 24.00 |
| Product specific overheads | 13.50 |

    In addition, each toy requires 0.6 kg of other materials, which are supplied at a cost of ₹ 16 per kg with a normal 4% substandard quality which is not usable in the manufacture.

    ***Required***

    Determine if the above cost structure is within the target cost. If not, what should be the extent of cost reduction?

**Cost Classification**

16. ANZB Financial Services Limited is an Indian banking and financial services company headquartered in Chennai, Tamil Nadu. Apart from lending to individuals, the company grants loans to micro, small and medium business enterprises. Listed below are several costs incurred in the loan division of ANZB Financial Services Limited.

    (i) Remuneration of the loan division manager.

    (ii) Cost of Printer Paper, File Folders, View Binders, Ink, Toner & Ribbons used in the loan division.

(iii) Cost of the division's MacBook Pro purchased by the loan division manager last year.

(iv) Cost of advertising in business newspaper by the bank, which is allocated to the loan division.

Cost Classification

| | | |
|---|---|---|
| Controllable by the loan division manager | Direct cost of the loan division | Sunk Cost |
| Uncontrollable by the loan division manager | Indirect Cost of the loan division | Out of Pocket Cost |

***Required***

For each Cost, indicate which of the above mentioned Cost Classification best describe the cost.

Note

More than one classification may apply to the same cost item.

## SUGGESTED ANSWERS/ HINTS

**1. 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 |

**2. (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**

Total Sale Value of Product '$D_1$' = ₹26,00,000

Total Contribution of Product '$D_1$' = ₹9,40,000

Specific Fixed Overheads (Product $D_1$) = ₹10,00,000

$$\text{Break-even Sales (₹)} = \frac{\text{Specific Fixed Cost}}{\text{Total Contribution}} \times \text{Total Sales Value}$$

$$= \frac{₹10,00,000}{₹9,40,000} \times ₹26,00,000$$

$$= ₹27,65,957.45$$

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

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 $\left(\frac{₹282.20}{₹13.00}\right)$.

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

Break-even units of product '$D_1$' 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) |

**3. 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 |

$$\text{Activity Level} = \frac{\text{Actual Sales at Budgeted Prices}}{\text{Budgeted Sales at Full Capacity}} \times 100$$

$$= \frac{₹10,90,000}{₹13,50,000} \times 100$$

$$= 80.74\ldots\%$$

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

$$\text{Variable Overhead} = \frac{\text{Overhead at Full Capacity - Overhead at 75\% Capacity}}{\text{Difference in Activity Level}}$$

$$= \frac{₹3,65,000 - ₹3,23,750}{25}$$

$$= ₹1,650$$

Fixed Overhead = Total SV Overheads at 100% Level – Variable Overheads at 100% level

= ₹3,65,000 – (₹1,650 × 100)

= ₹2,00,000

**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 |

**4. Statement Showing "Pareto Analysis of Defects"**

| Defect Type | No. of Items | % of Total Items | Cumulative Total |
|---|---|---|---|
| Scratches on the surface | 110 | 36.67% | 36.67% |
| Rough edges of lenses | 70 | 23.33% | 60.00% |
| Non-uniform grinding of lenses | 60 | 20.00% | 80.00% |
| Frame colours-shade differences | 25 | 8.33% | 88.33% |
| Power mismatches | 20 | 6.67% | 95.00% |
| End frame not equidistant from the centre | 10 | 3.33% | 98.33% |
| Spots/ Strain on lenses | 5 | 1.67% | 100.00% |
| | 300 | 100.00% | |

The company should focus on eliminating *scratches on the surface*, *rough edges of lenses* and *grinding of lenses* related defects which constitute 80% portion, according to Pareto Theory.

**5. 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*

Budgeted Market Share (in %) = $\frac{2,00,000 \text{units}}{4,00,000 \text{units}}$

= 50%

Actual Market Share (in %) = $\frac{1,65,000 \text{units}}{3,75,000 \text{units}}$

= 44%

Budgeted Contribution = ₹21,00,000 – ₹12,66,000

= ₹8,34,000

Average Budgeted Contribution (*per unit)* = $\frac{₹8,34,000}{₹2,00,000}$

= ₹4.17

Budgeted Sales Price *per unit* = $\frac{₹21,00,000}{₹2,00,000}$

= ₹10.50

Actual Sales Price *per unit* = $\frac{₹16,92,900}{₹1,65,000}$

= ₹10.26

Standard Variable Cost *per unit* = $\frac{₹12,66,000}{₹2,00,000}$

= ₹6.33

Actual Variable Cost *per unit* = $\frac{₹10,74,150}{₹1,65,000}$

= ₹6.51

*Calculation of Variances*

Sales Variances:

Volume Contribution Planning* = Budgeted Market Share % × (Actual Industry Sales Quantity *in units* – Budgeted Industry Sales Quantity *in units*) × (Average Budgeted Contribution *per unit*)

= 50% × (3,75,000 units – 4,00,000 units) × ₹4.17

= 52,125 (A)

(*) *Market Size Variance*

Volume Contribution Operational** = (Actual Market Share % – Budgeted Market Share %) × (Actual Industry Sales Quantity *in units*) × (Average Budgeted Contribution *per unit*)

= (44% – 50 %) × 3,75,000 units × ₹4.17

= 93,825 (A)

(**) *Market Share Variance*

Price = Actual Sales – Standard Sales

= Actual Sales Quantity × (Actual Price – Budgeted Price)

= 1,65,000 units × (₹10.26 – ₹10.50) = 39,600 (A)

Variable Cost Variances:

Cost = Standard Cost for Production – Actual Cost

= Actual Production × (Standard Cost *per unit* – Actual Cost *per unit*)

= 1,65,000 units × (₹6.33 – ₹6.51)

= ₹29,700(A)

Fixed Cost Variances:

Expenditure = Budgeted Fixed Cost – Actual Fixed Cost

= ₹3,15,000 – ₹3,30,000

= ₹15,000 (A)

☞

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

**6. (i) Statement Showing "Ranking for Manufacturing"**

| | A (₹) | B (₹) | C (₹) |
|---|---|---|---|
| Demand | 1,200 | 1,200 | 1,500 |
| Buy Price | 280 | ××× | 161 |
| *Less:* Variable Cost | 187 | 215 | 111 |
| Saving in Cost *per unit* | 93 | ××× | 50 |
| Hrs. Required -"Q" | 3 | 3 | 1 |
| Saving in Cost *per machine hour* | 31 | ××× | 50 |
| Ranking | III | I | II |

**Statement Showing "Optimum Production Plan"**

| Product | Units | Machine Hrs./ Unit | Machine Hrs. Required | Balance Hrs. |
|---|---|---|---|---|
| B | 1,200 | 3 | 3,600 | 4,200 |
| C | 1,500 | 1 | 1,500 | 2,700 |
| A (Balance) | 900* | 3 | 2,700 | --- |

* $\left(\frac{2,700\text{ hrs.}}{3\text{hrs.}}\right)$

**Balance quantity of A, 300 units to be purchased from outside.**

**(ii) Statement Showing "Conditions for Justification (i)"**

| | Product A | Product C |
|---|---|---|
| Buy Price | < 337 *Or* | > 142 |
| Variable Cost | > 130 *Or* | < 130 |

**7. Analysis of Cost *plus* Pricing Approach**

The company has a plan to produce 2,00,000 units and it proposed to adopt Cost *plus* Pricing approach with a markup of 25% on full budgeted cost. To achieve this pricing policy, the company has to sell its product at the price calculated below:

| | |
|---|---|
| Qty. | 2,00,000 units |
| Variable Cost (2,00,000 units × ₹ 32) | 64,00,000 |
| *Add:* Fixed Cost | 16,00,000 |
| Total Budgeted Cost | 80,00,000 |
| *Add:* Profit (25% of ₹ 80,00,000) | 20,00,000 |
| Revenue (need to earn) | 1,00,00,000 |
| Selling Price *per unit* $\left(\frac{₹\,1,00,00,000}{2,00,000\text{ units}}\right)$ | 50 p.u. |

However, at selling price ₹ 50 per unit, the company can sell 1,40,000 units only, which is 60,000 units less than the budgeted production units.

After analyzing the price-demand pattern in the market (which is price sensitive), to sell all the budgeted units market price needs to be further lowered, which might be lower than the total cost of production.

**Statement Showing "Profit at Different Demand & Price Levels"**

| | I | II | III | IV | Budgeted |
|---|---|---|---|---|---|
| Qty. (units) | 1,68,000 | 1,52,000 | 1,40,000 | 1,28,000 | 1,08,000 |

| | ₹ | ₹ | ₹ | ₹ | ₹ |
|---|---|---|---|---|---|
| Sales | 73,92,000 | 72,96,000 | 70,00,000 | 71,68,000 | 64,80,000 |
| *Less:* Variable Cost | 53,76,000 | 48,64,000 | 44,80,000 | 40,96,000 | 34,56,000 |
| Total Contribution | 20,16,000 | 24,32,000 | 25,20,000 | 30,72,000 | 30,24,000 |
| *Less:* Fixed Cost | 16,00,000 | 16,00,000 | 16,00,000 | 16,00,000 | 16,00,000 |
| Profit (₹) | 4,16,000 | 8,32,000 | 9,20,000 | 14,72,000 | 14,24,000 |
| Profit (% on total cost) | 5.96 | 12.87 | 15.13 | 25.84% | 28.16% |

**Determination of the Best Course of Action**

(i) Taking the above calculation and analysis into account, the company should produce and sell 1,28,000 units at ₹ 56. At this price company will not only be able to achieve its desired mark up of 25% on the total cost but can earn maximum contribution as compared to other even higher selling price.

(ii) If the company wants to uphold its proposed pricing approach with the budgeted quantity, it should try to reduce its variable cost per unit for example by asking its supplier to provide a quantity discount on the materials purchased.

**8. (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 *per unit* of Product Z (₹2,48,00,000 ÷ 40,000 units) | 620 |
| Transfer Price of Product Z to Division B (Variable Cost *per unit* + Contribution *per unit*) | 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.

**9.** 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% × ₹64 + 10% × ₹16 + 5% × ₹40 + 80% × ₹16

= ₹19.60 per kg

**Cost of Product P2**

= 5% × ₹64 + 5% × ₹16 + 10% × ₹40 + 80% × ₹16

= ₹20.80 per kg.

**Cost of Product P3**

= 20% × ₹64 + 5% × ₹16 + 10% × ₹40 + 65% × ₹16

= ₹28.00 per kg.

Let $x_1$, $x_2$, and $x_3$ be the quantity (in kg) of $P_1$, $P_2$, and P3 respectively to be manufactured. The LP problem can be formulated:

*Objective function:*

Maximise Z = (Selling Price - Cost Price) × Quantity of Product

= (₹32.60 − ₹19.60) $x_1$ + (₹34.80 − ₹20.80) $x_2$ + (₹36.00 − ₹28) $x_3$

= $13x_1 + 14x_2 + 8x_3$

*Subject to Constraints:*

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

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

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

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

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

*Or* $x_1 + 2x_2 + 2x_3 \leq 2,400$

$x_1 \leq 30$

*and* $x_1, x_2, x_3 \geq 0$

**10.** 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<br>300<br>- | 150<br>150<br>150 | 600<br>--<br>- | 0<br>0<br>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 $C_3$, 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-

**$\Delta_{ij}$ 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 |

**11. (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 do not 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 start time 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.

**12. 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** |

**13. (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 | = | Log of learning ratio ÷ Log of 2 |
| | = | log 0.93 ÷ log 2 |
| | = | −0.0315 ÷ 0.3010 |
| | = | −0.1047 |

**14. (i)** 'Learning Curve Theory' will not be applicable as *alloy combination of the input metal is quite different* among the suppliers hence learning experience with one type of metal may not be beneficial for the workers to deal with other metal with separate alloy composition.

**(ii)** 'Learning Curve Theory' will not be applicable as in this situation *rotation of labour is done frequently*, labours will not be able to get the benefit of learning and apply their learning. Hence, learning curve theory can not be applied.

**(iii)** 'Learning Curve Theory' will not be applicable as in this situation as *workers are skilled and employed for a long time*, they have already achieved maximum level of expertise by taking advantage of learning. Hence, at this point of time learning curve theory can not be applied.

**(iv)** 'Learning Curve Theory' will not be applicable as indirect materials are the materials which are not used directly in the production (not directly proportionate with volume of output) and usually used machines (e.g. lubricants, spares parts etc.) with less human interactions. Adverse usage of indirect materials can be controlled through proper monitoring and appropriate standard settings and not from applying learning curve theory.

**15. Statement Showing Target Cost "Z"**

| | ₹ / Toy |
|---|---|
| Target Selling Price | 100.00 |
| *Less:* Royalty @15% | 15.00 |
| *Less:* Profit @ 25% | 25.00 |
| Target Cost | 60.00 |

**Statement Showing Cost Structure "Z"**

| | ₹ / Toy |
|---|---|
| Component A | 8.50 |
| Component B | 7.00 |

| | |
|---|---|
| Labour (0.40 hr. × ₹ 60 per hr.) | 24.00 |
| Product Specific Overheads | 13.50 |
| Other Material (0.6 kg / 96% × ₹16) | 10.00 |
| Total Cost of Manufacturing | 63.00 |

Total Cost of Manufacturing is ₹ 63 while Target Cost is ₹ 60. Company "T" should make efforts to **reduce its manufacturing cost by ₹ 3** to achieve Target Selling Price of ₹100.

**16. Cost Incurred – Cost Classification**

| S. No. | Cost Incurred | Classification 1 | Classification 2 | Classification 3 |
|---|---|---|---|---|
| (i) | Remuneration of the loan division manager. | Uncontrollable by the loan division manager. | Direct cost of the loan division. | Out of Pocket Cost |
| (ii) | Cost of Printer Paper, File Folders, View Binders, Ink, Toner & Ribbons used in the loan division. | Controllable by the loan division manager. | Direct cost of the loan division. | Out of Pocket Cost |
| (iii) | Cost of the division's MacBook Pro purchased by the loan division manager last year. | Controllable by the loan division manager. | Direct cost of the loan division. | Sunk Cost |
| (iv) | Cost of advertising in business newspaper by the bank, which is allocated to the loan division. | Uncontrollable by the loan division manager. | Indirect Cost of the loan division. | Out of Pocket Cost |

## PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

## QUESTIONS

### Value Added/ Non- Value Added Activities

1. Qwerty manufactures high-quality wooden doors within the forests of Qtown since 1967. Management is having emphasize on creativity, engineering, innovation and experience to provide customers with the door they desire, whether it is a standard design or a one-of-a-kind custom door. The following information pertains to operations during April:

| | | | |
|---|---|---|---|
| Processing time | 9.0 hrs.* | Waiting time | 6.0 hrs.* |
| Inspection time | 1.5 hr.* | Move time | 7.5 hrs.* |
| Units per batch | 60 units | | |

*(*) average time per batch*

***Required***

Compute the following operational measures:

(i) Average non-value-added time per batch

(ii) Average value added time per batch

(iii) Manufacturing cycle efficiency

(iv) Manufacturing cycle time

### Life Cycle Costing and Pricing Strategy

2. OR International Ltd. (ORIL) has developed a new product '$\alpha^3$'which is about to be launched into the market. Company has spent ₹ 30,00,000 on R&D of product '$\alpha^3$'. It has also bought a machine to produce the product '$\alpha^3$' costing ₹ 11,25,000 with a capacity of producing 1,100 units per week. Machine has no residual value.

The company has decided to charge price that will change with the cumulative numbers of units sold:

| Cumulative Sales (units) | Selling Price ₹ per unit |
|---|---|
| 0 to 2,200 | 750 |
| 2,201 to 7,700 | 600 |
| 7,701 to 15,950 | 525 |
| 15,951 to 59,950 | 450 |
| 59,951 and above | 300 |

Based on these selling prices, it is expected that sales demand will be as shown below:

| Weeks | Sales Demand *per week (units)* |
|---|---|
| 1-10 | 220 |
| 11-20 | 550 |
| 21-30 | 825 |
| 31-70 | 1,100 |
| 71-80 | 880 |
| 81-90 | 660 |
| 91-100 | 440 |
| 101-110 | 220 |
| Thereafter | NIL |

Unit variable costs are expected to be as follows:

| | ₹ per unit |
|---|---|
| First 2,200 units | 375 |
| Next 13,750 units | 300 |
| Next 22,000 units | 225 |
| Next 22,000 units | 188 |
| Thereafter | 225 |

ORIL uses just-in-time production system. Following is the total contribution statement of the product '$\alpha^3$' for its Introduction and Growth phase:

| | Introduction | Growth | |
|---|---|---|---|
| Weeks | 1 - 10 | 11 - 30 | |
| Number of units Produced and Sold | 2,200 | 5,500 | 8,250 |
| Selling Price *per unit* (₹) | 750 | 600 | 525 |
| Variable Cost *per unit* (₹) | 375 | 300 | 300 |
| Contribution *per unit* (₹) | 375 | 300 | 225 |
| Total Contribution (₹) | 8,25,000 | 16,50,000 | 18,56,250 |

***Required***

(i) Prepare the total contribution statement for each of the remaining two phases of the product's life cycle.

(ii) Discuss Pricing Strategy of the product '$\alpha^3$'.

(iii) Find possible reasons for the changes in cost during the life cycle of the product '$\alpha^3$'.

Note: Ignore the time value of money.

**Value Chain Analysis – Primary Activity**

3. Sinopec Ltd. is engaged in business of manufacturing branded readymade garments. It has a single manufacturing facility at Surat. Raw material is supplied by various suppliers.

   Majority of its revenue comes from export to Euro Zone and US. To strengthen its position further in the Global Market, it is planning to enhance quality and provide assurance through long term warranty.

   For the coming years company has set objective to reduce the quality costs in each of the primary activities in its value chain.

   ***Required***

   State the primary activities as per Porter's Value Chain Analysis in the value chain of Sinopec Ltd with brief description.

**Just in Time**

4. YP Ltd. (YPL) manufactures and sells one product called "YEIA". Managing Director is not happy with its current purchasing and production system. There has been considerable discussion at the corporate level as to use of 'Just in Time' system for "YEIA". As per the opinion of managing director of YPL Ltd. - *"Just-in-time system is a pull system, which responds to demand, in contrast to a push system, in which stocks act as buffers between the different elements of the system such as purchasing, production and sales. By using Just in Time system, it is possible to reduce carrying cost as well as other overheads".*

   YPL is dependent on contractual labour which has efficiency of 95%, for its production. The labour has to be paid for minimum of 4,000 hours per month to which they produce 3,800 standard hours.

   For availing services of labour above 4,000 hours in a month, YPL has to pay overtime rate which is 45% premium to the normal hourly rate of ₹110 per hour. For avoiding this overtime payment, YPL in its current production and purchase plan utilizes full available normal working hours so that the higher inventory levels in the month of lower demand would be able to meet sales of month with higher demand level. YPL has determined that the cost of holding inventory is ₹70 per month for each standard hour of output that is held in inventory.

   YPL has forecast the demand for its products for the first six months of year 2017 as follows:

| Month | Demand (Standard Hrs) |
|---|---|
| Jan'17 | 3,150 |
| Feb'17 | 3,760 |
| Mar'17 | 4,060 |
| Apr'17 | 3,350 |
| May'17 | 3,650 |
| Jun'17 | 4,830 |

Following other information is given:

(a) All other production costs are either fixed or are not driven by labour hours worked.

(b) Production and sales occur evenly during each month and at present there is no stock at the end of Dec'16.

(c) The labour are to be paid for their minimum contracted hours in each month irrespective of any purchase and production system.

***Required***

As a chief accountant, you are requested to comment on managing director's view.

**Break-even Point – Production in Batches**

5. Z 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:

| | Alpha | Beta | Gamma | Theta | 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:

Alpha.....10,00,000

Beta.....1,00,000

Gamma..... 2,00,000

Theta..... 1,00,000.....14,00,000

General fixed overheads.....6,20,000

31,00,000

The other information is as follows:-

| | Alpha | Beta | Gamma | Theta | 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***

(i) Prepare a profitability statement that is more useful for decision making than the profit statement prepared by Z Ltd.

(ii) Calculate the break- even volume in batches and also in approximate units for Product 'Alpha'.

**Determination of Production Mix/ Production Planning**

6. A company is producing three products P, Q & R. Relevant information is given below:

| Product | P | Q | R |
|---|---|---|---|
| Raw material per unit (kg) | 20 | 12 | 30 |
| Machine hours per unit (hours) | 3 | 5 | 4 |
| Selling price per unit (₹) | 500 | 400 | 800 |
| Maximum limit of production Unit | 1,500 | 1,500 | 750 |

Only 9,200 hours are available for production at a cost of ₹20 per hour and maximum 50,000 kgs. of material @ ₹ 20 per kg., can be obtained.

(Only product mix quantities are to be shown, calculation of total profit at that product mix not required to be shown)

***Required***

On the basis of the above information determine the product-mix to give the highest profit if at least two products are produced.

**Pareto Analysis**

7. Generation 2050 Technologies 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% |

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

**Budget and Budgetary Control**

8. KLM Ltd manufactures and sells a single product and has estimated sales revenue of ₹397.80 lacs during the year based on 20% profit on selling price. Each unit of product requires 6 kg of material W and 3 kg of material X and processing time of 4 hours in machine shop and 2 hours in assembly shop. Factory overheads are absorbed at a blanket rate of 20% of direct labour. Variable selling & distribution overheads are ₹ 6 per unit sold and fixed selling & distribution overheads are estimated to be ₹7,20,000.

The other relevant details are as under:

| | | | |
|---|---|---|---|
| Purchase Price | Material W | ₹16 per kg | |
| | Materials X | ₹10 per kg | |
| Labour Rate | Machine Shop | ₹14 per hour | |
| | Assembly Shop | ₹7 per hour | |
| | **Finished Stock** | **Material W** | **Material X** |
| Opening Stock | 25,000 units | 75,000 kg | 40,000 kg |
| Closing Stock | 30,000 units | 80,000 kg | 55,000 kg |

***Required***

Calculate

(i) Number of units of product proposed to be sold and selling price per unit.

(ii) Production budget in units.

(iii) Material purchase budget in units.

**Standard Costing – Reconciliation of Budgeted and Actual Profit**

9. KYC Toys Ltd. manufactures a single product and the standard cost system is followed. Standard cost per unit is worked out as follows:

| | ₹ |
|---|---|
| Materials (10 Kgs. @ ₹4 per Kg) | 40 |
| Labour (8 hours @ ₹8 per hour) | 64 |
| Variable overheads (8 hours @ ₹3 per hour) | 24 |
| Fixed overheads (8 hours @ ₹3 per hour) | 24 |
| Standard Profit | 56 |

Overheads are allocated on the basis of direct labour hours. In the month of April 2018, there was no difference between the budgeted and actual selling price and there were no opening or closing stock during the period.

The other details for the month of April 2018 are as under

| | Budgeted | Actual |
|---|---|---|
| Production and Sales | 2,000 Units | 1,800 Units |
| Direct Materials | 20,000 Kgs. @ ₹ 4 per kg | 20,000 Kgs.@ ₹ 4 per kg |
| Direct Labour | 16,000 Hrs. @ ₹ 8 per Hr. | 14,800 Hrs. @ ₹ 8 per Hr. |
| Variable Overheads | ₹ 48,000 | ₹ 44,400 |
| Fixed Overheads | ₹ 48,000 | ₹ 48,000 |

***Required***

Reconcile the budgeted and actual profit with the help of variances according to each of the following method:

(i) The conventional method

(ii) The relevant cost method assuming that

(a) Materials are scarce and are restricted to supply of 20,000 Kgs. for the period.

(b) Labour hours are limited and available hours are only 16,000 hours for the period.

(c) There are no scarce inputs.

**Transfer Pricing**

10. Divisions X and Y are two divisions in XY Ltd. Division X manufactures a component (X) which is sold to external customers and also to Division Y.

Details of Division X are as follows:

| | |
|---|---|
| Market price per component | ₹ 300 |
| Variable cost per component | ₹ 157 |
| Fixed costs per production period | ₹ 20,62,000 |
| Demand from Y Division per production period | 20,000 components |
| Capacity per production period | 35,000 components |

Division Y assembles a product (Y) which is sold to external customers. Each unit of Y requires two units of X.

Details of Division Y are as follows:

| | | |
|---|---|---|
| Selling price per unit | | ₹1,200 |
| Variable cost per unit: | | |
| (i) | Two components from X | 2@ transfer price |
| (ii) | Other variable costs per unit | ₹ 375 |
| Fixed costs per production period | | ₹ 13,50,000 |
| Demand per production period | | 10,000 units |
| Capacity per production period | | 10,000 units |

**The Group Transfer Pricing Policy stipulates that**

Transfers must be at opportunity cost.

Y must buy the components from X.

X must satisfy the demand from Y before making external sales.

***Required***

(i) Present figures showing the weighted average transfer price, per component transferred to Y and the total profits earned by X for each of the following levels of external demand of X:

External demand = 15,000 components

External demand = 19,000 components

External demand = 35,000 components

(ii) Compute Division Y's profits when Division X has each of the above levels of demand.

(Only relevant figures need to be discussed. A detailed profitability statement for each situation is not required).

**Transportation Problem - Degeneracy**

11. A project consists of four (4) major jobs, for which four (4) contractors have submitted tenders. The tender amounts, in thousands of rupees, are given in the each cell. The initial solution of the problem obtained by using Vogel's Approximation Method is given in the Table below:

| Contractors | Job P | Job Q | Job R | Job S |
|---|---|---|---|---|
| A | 112.50 | 100.00 | 127.50 | 167.50 [1] |
| B | 142.50 | 105.00 [1] | 157.50 | 137.50 |
| C | 122.50 | 130.00 | 120.00 [1] | 160.00 |
| D | 102.50 [1] | 112.50 | 150.00 | 137.50 |

Find the assignment, which minimizes the total cost of the project. Each contractor has to be awarded one job only.

**Critical Path Analysis – Missing Figures and Network**

12. The number of days of total float (TF), earliest start times (EST) and duration in days are given for some of the following activities.

| Activity | TF | EST | Duration |
|---|---|---|---|
| 1–2 | 0 | 0 | ??? |
| 1–3 | 2 | ??? | ??? |
| 1–4 | 5 | ??? | ??? |
| 2–4 | 0 | 4 | ??? |
| 2–5 | 1 | ??? | 5 |
| 3–6 | 2 | 12 | ??? |
| 4–6 | 0 | 12 | ??? |
| 5–7 | 1 | ??? | ??? |
| 6–7 | ??? | 23 | ??? |
| 6–8 | 2 | ??? | ??? |
| 7–8 | 0 | 23 | ??? |
| 8–9 | ??? | 30 | 6 |

(i) Find??? Figures.

(ii) Draw the network.

(iii) List the paths with their corresponding durations and state when the project can be completed.

**PERT and CPM – Basic Concepts**

13. State the validity of following statements along with the reasons:

(i) Two activities have common predecessor and successor activities. So, they can have common initial and final nodes.

(ii) In respect of any activity whether real or dummy, the terminal node should bear a number higher than the initial node number.

(iii) The difference between the latest event time and the earliest event time is termed as free float.

(iv) 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.

(v) 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**

14. An Investment Corporation wants to study the investment projects based on four factors: market demand in units, contribution per unit, advertising cost and the investment required. These factors are felt to be independent of each other. In analyzing a new consumer product, the corporation estimates the following probability distributions:

| Demand (units) | | Contribution per unit | | Advertising Cost | |
|---|---|---|---|---|---|
| No. | Probability | ₹ | Probability | ₹ | Probability |
| 10,000 | 0.20 | 25 | 0.25 | 50,000 | 0.22 |
| 20,000 | 0.25 | 35 | 0.30 | 60,000 | 0.33 |
| 30,000 | 0.30 | 45 | 0.35 | 70,000 | 0.44 |
| 40,000 | 0.25 | 55 | 0.10 | 80,000 | 0.01 |

The data for proposed investments are as follows:

| Investment (₹) | 50,00,000 | 55,00,000 | 60,00,000 | 65,00,000 |
|---|---|---|---|---|
| Probability | 0.10 | 0.30 | 0.45 | 0.15 |

Using simulation process, repeat the trials 5 times, compute the Return on Investment (ROI) for each trial and find the highest likely return.

Using the sequence (First 4 random numbers for the first trial, etc.)

09 24 85 07 84 38 16 48 41 73 54 57 92 07 99

64 65 04 78 72

**Application of Learning Curve in Standard Costing**

15. Aldi International Co. is a multiproduct firm and operates standard costing and budgetary control system. During the month of June firm launched a new product. An extract from performance report prepared by Sr. Accountant is as follows:

| Particulars | Budget | Actual |
|---|---|---|
| Output | 30 units | 25 units |
| Direct Labour Hours | 180.74 hrs. | 118.08 hrs. |
| Direct Labour Cost | ₹ 1,19,288 | ₹ 79,704 |

Sr. Accountant prepared performance report for new product on certain assumptions but later on he realized that this new product has similarities with other existing product of the company. Accordingly, the rate of learning should be 80% and that the learning would cease after 15 units. Other budget assumptions for the new product remain valid.

The original budget figures are based on the assumption that the labour has learning rate of 90% and learning will cease after 20 units, and thereafter the time per unit will be the same as the time of the final unit during the learning period, i.e. the 20th unit. The time taken for 1st unit is 10 hours.

Show the variances that reconcile the actual labour figures with revised budgeted figures in as much detail as possible.

Note:

The learning index values for a 90% and a 80% learning curve are −0.152 and −0.322 respectively.

[log 2 = 0.3010, log 3 = 0.47712, log 5 = 0.69897, log 7 = 0.8451, antilog of 0.6213 = 4.181, antilog of 0.63096 = 4.275]

**Profitability Analysis**

16. A company is planning to improve its profit level at least by 10% from the preliminary budget estimates of a profit of ₹32,80,000 for the coming year. It has worked out the following profit improvement plan:

(i) In the year just concluded the sales of the company were 10% of the total market of 12,00,000 units. For the preparation of the original budget estimate, the same market demand and the same share of market for the company was envisaged. Now it has been estimated that the total market demand will increase by 18% and the company's market share will increase to 11% from the present level of 10%.

(ii) The products are sold in two sizes - large and medium. The sales mix of each size was 50:50 so far. Now it is planned that the sales will be 40% of large and 60% of medium. The medium packs and large packs have a contribution of ₹ 10 and ₹ 8 per pack respectively. The budget proposes to raise the price in such a manner that the contribution per pack will increase by ₹ 0.60 for each size.

(iii) There will be an additional expenditure on sales promotion worth ₹78,000.

(iv) The company proposes to save ₹9,000 by saving on interest cost in the coming year by better financial management.

***Required***

Draw a profit improvement plan in financial terms and spell out separately the effect of various factors on profit.

## SUGGESTED ANSWERS/ HINTS

**1. (i)** Average Non Value Added Time *per batch*

= Inspection Time + Waiting Time + Move Time

= 1.5 hr. + 6.0 hrs. + 7.5 hrs.

= 15 hrs.

**(ii)** Average Value Added Time per batch

= Processing Time

= 9 hrs.

**(iii)** Manufacturing Cycle Efficiency

$$= \frac{\text{Processing Time}}{\text{Processing Time + Inspection Time + Waiting Time + Move Time}}$$

$$= \frac{9.0\text{ hrs.}}{9.0\text{ hrs.} + 1.5\text{ hr.} + 6.0\text{ hrs.} + 7.5\text{ hrs.}}$$

= 37.5%

**(iv)** Manufacturing Cycle Time

$$= \frac{\text{Total Production Time}}{\text{Units per Batch}}$$

$$= \frac{24\text{ hrs.}}{60\text{ units}}$$

= 0.40 hrs. *per unit*

**2. (i) Total Contribution Statement**

**Statement Showing 'Total Contribution' for remaining two phases**

| Particulars | Maturity | | Decline |
|---|---|---|---|
| Weeks | 31 - 50 | 51 - 70 | 71 - 110 |
| Number of units Produced and Sold | 22,000 | 22,000 | 22,000 |

| | | | |
|---|---|---|---|
| Selling Price per unit (₹) | 450 | 450 | 300 |
| Unit Variable Cost (₹) | 225 | 188 | 225 |
| Unit Contribution (₹) | 225 | 262 | 75 |
| Total Contribution (₹) | 49,50,000 | 57,64,000 | 16,50,000 |

**(ii) Pricing Strategy for Product $\alpha^3$**

ORIL is following the skimming price strategy that's why it has planned to launch the product $\alpha^3$ initially with high price tag.

A skimming strategy may be recommended when a firm has incurred large sums of money on research and development for a new product.

In the question, ORIL has incurred a huge amount on research and development. Also, it is very difficult to start with a low price and then raise the price. Raising a low price may annoy potential customers.

Price of the product $\alpha^3$ is decreasing gradually stage by stage. This is happening because ORIL wants to tap the mass market by lowering the price.

**(iii) Possible reasons for the changes in cost during the life cycle of the product '$\alpha^3$'**

Product life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their entire life cycle. Possible reasons for the changes in cost during the life cycle of the product are as follows:

ORIL is expecting reduction in unit cost of the product $\alpha^3$ over the life of product as a consequence of economies of scale and learning / experience curves.

Learning effect may be the possible reason for reduction in per unit cost if the process is labour intensive. When a new product or process is started, performance of worker is not at its best and learning phenomenon takes place. As the experience is gained, the performance of worker improves, time taken per unit reduces and thus his productivity goes up. The amount of improvement or experience gained is reflected in a decrease in cost.

Till the stage of maturity, ORIL is in the expansion mode. The ORIL may be able to take advantages of quantity discount offered by suppliers or may negotiate the price with suppliers.

Product $\alpha^3$ has the least variable cost ₹188 in last phase of maturity stage; this is because a product which is in the mature stage may require less marketing support than a product which is in the growth stage so, there is a saving of marketing cost per unit.

Again, the cost per unit of the product $\alpha^3$ jumps to ₹225 in decline stage. As soon as the product reaches its decline stage, the need or demand for the product disappear and quantity discount may not be available. Even ORIL may have to incur heavy marketing expenses for stock clearance.

**Workings:**

**Statement of Cumulative Sales along with Sales Price and Variable Cost**

| Weeks | Demand per week | Total Sales | Cumulative Sales | Selling Price per unit (₹) | Variable Cost per unit (₹) |
|---|---|---|---|---|---|
| 1 - 10 | 220 | 2,200 | 2,200 | 750 | 375 |
| 11 - 20 | 550 | 5,500 | 7,700 | 600 | 300 |
| 21 - 30 | 825 | 8,250 | 15,950 | 525 | 300 |
| 31 - 50 | 1,100 | 22,000 | 37,950 | 450 | 225 |
| 51 - 70 | 1,100 | 22,000 | 59,950 | 450 | 188 |
| 71 - 80 | 880 | 8,800 | 68,750 | 300 | 225 |
| 81 - 90 | 660 | 6,600 | 75,350 | 300 | 225 |
| 91 - 100 | 440 | 4,400 | 79,750 | 300 | 225 |
| 101 - 110 | 220 | 2,200 | 81,950 | 300 | 225 |

**3.** Primary activities are the activities that are directly involved in transforming inputs into outputs and delivery and after-sales support to output. Following are the primary activities in the value chain of Sinopec Ltd:

**(i)** **Inbound Logistics**: These activities are related to the material handling and warehousing. It also covers transporting raw material from the supplier to the place of processing inside the factory.

**(ii)** **Operations:** These activities are directly responsible for the transformation of raw material into final product for the delivery to the consumers.

**(iii)** **Outbound Logistics:** These activities are involved in movement of finished goods to the point of sales. Order processing and distribution are major part of these activities.

**(iv)** **Marketing and Sales:** These activities are performed for demand creation and customer solicitation. Communication, pricing and channel management are major part of these activities.

**(v)** **Service:** These activities are performed after selling the goods to the consumers. Installation, repair and parts replacement are some examples of these activities.

**4.** **Workings**

**Statement Showing 'Inventory Holding Cost' under Current System**

| Particulars | | Jan | Feb | Mar | Apr | May | Jun |
|---|---|---|---|---|---|---|---|
| Opening Inventory* | (A) | --- | 650 | 690 | 430 | 880 | 1,030 |
| *Add:* Production* | | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 |
| *Less:* Demand* | | 3,150 | 3,760 | 4,060 | 3,350 | 3,650 | 4,830 |
| Closing Inventory* | (B) | 650 | 690 | 430 | 880 | 1,030 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| Average Inventory $\left(\frac{A+B}{2}\right)$ | 325 | 670 | 560 | 655 | 955 | 515 |
| Inventory Holding Cost @ ₹70 | 22,750 | 46,900 | 39,200 | 45,850 | 66,850 | 36,050 |

(*) *in terms of standard labour hours*

Inventory Holding Cost *for the six months* = ₹2,57,600

(₹ 22,750 + ₹ 46,900 + ₹ 39,200 + ₹ 45,850 + ₹ 66,850 + ₹ 36,050)

**Calculation of Relevant Overtime Cost under JIT System**

| Particulars | Jan | Feb | Mar | Apr | May | Jun |
|---|---|---|---|---|---|---|
| Demand* | 3,150 | 3,760 | 4,060 | 3,350 | 3,650 | 4,830 |
| Production* | 3,150 | 3,760 | 4,060 | 3,350 | 3,650 | 4,830 |
| Normal Availablility* | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 | 3,800 |
| Shortage (=Overtime*) (C) | --- | --- | 260 | ---- | ---- | 1,030 |
| Actual Overtime Hours $\left(\frac{C}{0.95}\right)$ | --- | --- | 273.68 | ---- | ---- | 1,084.21 |
| Overtime Payment @ ₹159.50 [110+45%] | --- | --- | 43,652 | ---- | ---- | 1,72,931 |

(*) *in terms of standard labour hours*

Total Overtime payment = ₹ 2,16,583

(₹ 43,652 + ₹ 1,72,931)

Therefore, saving in JIT system = ₹ 2,57,600 – ₹ 2,16,583 = ₹ 41,017

**Comments**

Though YPL is saving ₹41,017 by changing its production system to Just-in-time but it has to consider other factors as well before taking any final call which are as follows:-

(i) YPL has to ensure that it receives materials from its suppliers on the exact date and at the exact time when they are needed. Credentials and reliability of supplier must be thoroughly checked.

(ii) To remove any quality issues, the engineering staff must visit supplier's sites and examine their processes, not only to see if they can reliably ship high-quality parts but also to provide them with engineering assistance to bring them up to a higher standard of product.

(iii) YPL should also aim to improve quality at its process and design levels with the purpose of achieving "Zero Defects" in the production process.

(iv) YPL should also keep in mind the efficiency of its work force. YPL must ensure that labour's learning curve has reached at steady rate so that they are capable of

performing a variety of operations at effective and efficient manner. The workforce must be completely retrained and focused on a wide range of activities.

**5. (i) Statement of Profitability of Z Ltd.**

| | Products (Amount in ₹) | | | | |
|---|---|---|---|---|---|
| | **Alpha** | **Beta** | **Gamma** | **Theta** | **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**

Total Sale Value of Product 'Alpha' = ₹ 26,00,000

Total Contribution of Product 'Alpha' = ₹ 9,40,000

Specific Fixed Overheads (Product Alpha) = ₹ 10,00,000

$$\text{Break-even Sales (₹)} = \frac{\text{Specific Fixed Cost}}{\text{Total Contribution}} \times \text{Total Sales Value}$$

$$= \frac{₹\,10,00,000}{₹\,9,40,000} \times ₹26,00,000$$

$$= ₹27,65,957.45$$

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

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 $\left(\frac{₹\,282.20}{₹\,13.00}\right)$.

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

Break-even units of product 'Alpha' 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 | Alpha | Beta | Gamma | Theta |
|---|---|---|---|---|
| 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) |

**6. Computation of Contribution per Key Factor(s) for Various Products**

| Particulars | Products | | |
|---|---|---|---|
| | P | Q | R |
| Selling Price p. u. (₹) | 500 | 400 | 800 |
| Variable Cost p. u. (₹): | | | |
| Material | 400 (₹20 × 20 Kg.) | 240 (₹20 × 12 Kg.) | 600 (₹20 × 30 Kg.) |
| Machine Charge | 60 (₹20 × 3 hrs) | 100 (₹ 20 × 5 hrs) | 80 (₹20 × 4 hrs) |
| Total Variable Cost p. u. (₹) | 460 | 340 | 680 |
| Contribution p. u. (₹) | 40 | 60 | 120 |
| **Ranking** | **III** | **II** | **I** |
| Requirement of Material (Kg.) | 20 | 12 | 30 |

| | | | |
|---|---|---|---|
| Contribution per Kg. (₹) | 2.00 | 5.00 | 4.00 |
| **Ranking** | **III** | **I** | **II** |
| Requirement of Machine Hours (Hrs.) | 3 | 5 | 4 |
| Contribution *per hour* (₹) | 13.33 | 12.00 | 30.00 |
| **Ranking** | **II** | **III** | **I** |

It is clear from the above ranking(s):-

I. Contribution per Unit is maximum in case of product Q & R.

II. Contribution per Kg. of Raw Material also maximum in case of product Q & R.

III. Contribution per Machine Hour is maximum in case of product P & R.

So product R is common in all cases and priority shall be given for production of 'R'. Balance resources should be divided between other two products P & Q.

**Statement Showing Balance Resources for Product P & Q**

| Resources | Maximum Availability (a) | Maximum Production R (b) | Consumption of Resources p.u. (c) | Total Cons. (d) = (b) x (c) | Balance (a) - (d) |
|---|---|---|---|---|---|
| Material | 50,000 Kg. | 750 | 30 Kg. | 22,500 Kg. | 27,500 Kg. |
| Machine Hrs. | 9,200 Hrs. | 750 | 4 Hrs. | 3,000 Hrs. | 6,200 Hrs. |

The production of P & Q may be calculated with the help of following equations by utilizing balance resources: -

$$20P + 12Q = 27,500 \quad \ldots(i)$$
$$3P + 5Q = 6,200 \quad \ldots(ii)$$

Then,

$$30P + 18Q = 41,250$$

*equation (i) multiplied by 1.5*

$$30P + 50Q = 62,000$$

*equation (ii) multiplied by 10*

$$-32Q = -20,750$$
$$Q = 648.43 \text{ i.e. } 648 \text{ units}$$

Putting the value of Y in equation (ii)

$$3P + (5 \times 648) = 6,200$$

*Or*

$$3P = 2,960$$

*Or*

$$P = 986 \text{ units}$$

So the of Product Mix is

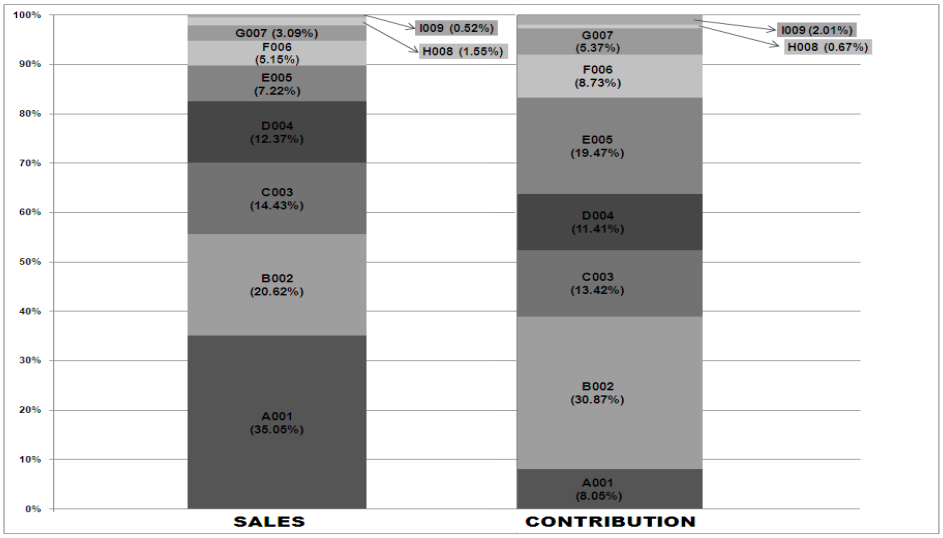
P= 986 units; Q = 648 units; R = 750 units

**7. 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.

**8 (i) Workings:**

**Statement Showing Total Variable Cost *for the year***

| **Particulars** | **Amount (₹)** |
|---|---|
| Estimated Sales Revenue | 3,97,80,000 |
| *Less:* Desired Profit Margin on Sale @ 20% | 79,56,000 |
| Estimated Total Cost | 3,18,24,000 |
| *Less:* Fixed Selling and Distribution Overheads | 7,20,000 |
| Total Variable Cost | 3,11,04,000 |

**Statement Showing Variable Cost per unit**

| Particulars | Variable Cost p.u. (₹) |
|---|---|
| Direct Materials: | |
| W: 6 Kg. @ ₹16 per Kg. | 96 |
| X: 3 Kg. @ ₹10 per Kg. | 30 |
| Labour Cost: | |
| Machine Shop: 4 hrs. @ ₹14 per hour | 56 |
| Assembly Shop: 2 hrs. @ ₹7 per hour | 14 |
| Factory Overheads: 20% of (₹56 + ₹14) | 14 |
| Variable Selling & Distribution Expenses | 6 |
| Total Variable Cost *per unit* | 216 |

Number of Units Sold = Total Variable Cost / Variable Cost *per unit*

= ₹3,11,04,000 / ₹216

= 1,44,000 units

Selling Price *per unit* = Total Sales Value / Number of Units Sold

= ₹3,97,80,000 / 1,44,000 units

= ₹276.25

**(ii) Production Budget (units)**

| Particulars | Units |
|---|---|
| Budgeted Sales | 1,44,000 |
| *Add:* Closing Stock | 30,000 |
| Total Requirements | 1,74,000 |
| *Less:* Opening Stock | 25,000 |
| Required Production | 1,49,000 |

**(iii) Materials Purchase Budget (Kg.)**

| Particulars | Material W | Material X |
|---|---|---|
| Requirement for Production | 8,94,000 (1,49,000 units × 6 Kg.) | 4,47,000 (1,49,000 units × 3 Kg.) |
| *Add*: Desired Closing Stock | 80,000 | 55,000 |
| Total Requirements | 9,74,000 | 5,02,000 |
| *Less*: Opening Stock | 75,000 | 40,000 |
| Quantity *to be purchased* | 8,99,000 | 4,62,000 |

**9. COMPUTATION OF VARIANCES**

Material Usage Variance = Standard Price × (Standard Quantity – Actual Quantity)

= ₹4.00 × (18,000* Kgs. – 20,000 Kgs.)

= ₹ 8,000 (A)

$$*\left(1{,}800\ \text{units} \times \frac{20{,}000\ \text{Kgs.}}{2{,}000\ \text{units}}\right)$$

Labour Efficiency Variance = Standard Rate × (Standard Hours – Actual Hours)

= ₹8.00 × (14,400* hrs. – 14,800 hrs.)

= ₹3,200 (A)

$$*\left(1{,}800\ \text{units} \times \frac{16{,}000\ \text{hrs.}}{2{,}000\ \text{units}}\right)$$

Variable Overhead Efficiency Variance

= Standard Variable Overheads for Production – Budgeted Variable Overheads for Actual hours

= (14,400 hrs. × Rs.3.00) – (₹3.00 × 14,800 hrs.)

= ₹1,200 (A)

Fixed Overhead Volume Variance

= Absorbed Fixed Overheads – Budgeted Fixed Overheads

= (14,400 hrs. × ₹3.00) – (16,000 hrs. × ₹3.00)

= ₹4,800 (A)

Sales Margin Volume Variance

= Standard Margin – Budgeted Margin

= (1,800 units × ₹56.00) – (2,000 units × ₹56.00)

= ₹11,200 (A)

Sales Contribution Volume Variance

= Standard Contribution – Budgeted Contribution

= (1,800 units × ₹80.00) – (2,000 units × ₹80.00)

= ₹16,000 (A)

**Statement Showing "Reconciliation Between Budgeted Profit & Actual Profit"**

| Particulars | Conv. Method (₹) | Relevant Cost Method (₹) | | |
|---|---|---|---|---|
| | | Scarce Material | Scarce Labour | No Scarce Inputs |
| Budgeted Profit (2,000 units × ₹56) | 1,12,000 | 1,12,000 | 1,12,000 | 1,12,000 |
| Sales Volume Variance | 11,200 (A) | NIL* | 12,000$ (A) | 16,000 (A) |
| Material Usage Variance | 8,000 (A) | 24,000 (A) | 8,000 (A) | 8,000 (A) |
| Labour Efficiency Variance | 3,200 (A) | 3,200 (A) | 7,200 (A) | 3,200 (A) |
| Variable Overhead Effi. Variance | 1,200 (A) | 1,200 (A) | 1,200 (A) | 1,200 (A) |
| Fixed Overhead Volume Variance | 4,800 (A) | N.A.# | N.A.# | N.A.# |
| Actual Profit | **83,600** | **83,600** | **83,600** | **83,600** |

**NOTES**

**Scarce Material**

Based on conventional method, direct material usage variance is ₹8,000 (A) i.e. 2,000 Kg. × ₹4. In this situation material is scarce, and, therefore, material cost variance based on relevant cost method should also include contribution lost per unit of material. Excess usage of 2,000 Kg. leads to lost contribution of ₹16,000 i.e. 2,000 Kgs. × ₹8. **Total material usage variance based on relevant cost method, when material is scarce will be: ₹8,000 (A) + ₹16,000 (A) = ₹24,000 (A).** Since labour is not scarce, labour variances are identical to conventional method.

Excess usage of 2,000 Kgs. leads to loss of contribution from 200 units i.e. ₹16,000 (200 units × ₹80). It is not the function of the sales manager to use material efficiently. Hence, loss of contribution from 200 units should be excluded while computing sales contribution volume variance.

**(*)→**

**Therefore, sales contribution volume variance, when materials are scarce will be NIL i.e. ₹16,000 (A) - ₹16,000 (A).**

**Scarce Labour**

Material is no longer scarce, and, therefore, the direct material variances are same as in conventional method. In conventional method, excess labour hours used are: 14,400 hrs. – 14,800 hrs. = 400 hrs. Contribution lost per hour = ₹10. Therefore, total contribution lost, when labour is scarce will be: 400 hrs. × ₹10 = ₹4,000. **Therefore, total labour efficiency variance, when labour hours are scarce will be ₹7,200 (A) i.e. ₹3,200 (A) + ₹4,000 (A).**

Excess usage of 400 hrs. leads to loss of contribution from 50 units i.e. ₹4,000 (50 units × ₹80). It is not the function of the sales manager to use labour hours efficiently. Hence, loss of contribution from 50 units should be excluded while computing sales contribution volume Variance.

**($)→**

**Therefore, sales contribution volume variance, when labour hours are Scarce will be ₹12,000 (A) i.e. ₹16,000 (A) - ₹4,000 (A).**

**Fixed Overhead Volume Variance**

**(#) →**

The fixed overhead volume variance does not arise in marginal costing system. In absorption costing system, it represents the value of the under or over absorbed fixed overheads due to change in production volume. When marginal costing is in use there is no overhead volume variance, because marginal costing does not absorb fixed overheads.

**10. (i) Computation of Weighted Average Transfer Price**

| Particulars | External Demand 15,000 Components | External Demand 19,000 Components | External Demand 35,000 Components |
|---|---|---|---|
| Component's Transfer Price (Base) | Variable Cost | Variable Cost *plus* Opportunity Cost for 4,000 Components | Variable Cost *plus* Opportunity Cost for 20,000 Components |
| Variable Cost | ₹157.00 | ₹157.00 | ₹157.00 |
| Opportunity Cost | 0 | ₹28.60 $\left(\frac{4,000}{20,000}\times ₹143\right)$ | ₹143.00 $\left(\frac{20,000}{20,000}\times ₹143\right)$ |
| Transfer Price | ₹157.00 | ₹185.60 | ₹300.00 |

Opportunity Cost for a Component is the Contribution *forgone* by not Selling it to the market.

Contribution = Market Selling Price – Variable Cost

= ₹300 – ₹157 = ₹143

**Statement Showing Profitability of Division- X**

| Particulars | External Demand 15,000 Components (₹) | External Demand 19,000 Components (₹) | External Demand 35,000 Components (₹) |
|---|---|---|---|
| Sales : | | | |
| Division-Y | 31,40,000 | 37,12,000 | 60,00,000 |

| | (₹157 × 20,000) | (₹185.60 × 20,000) | (₹300 × 20,000) |
|---|---|---|---|
| Market | 45,00,000 (₹300 × 15,000) | 45,00,000 (₹300 × 15,000) | 45,00,000 (₹300 × 15,000) |
| Total Revenue | 76,40,000 | 82,12,000 | 1,05,00,000 |
| *Less:* Variable Cost (₹157 × 35,000) | 54,95,000 | 54,95,000 | 54,95,000 |
| *Less:* Fixed Cost | 20,62,000 | 20,62,000 | 20,62,000 |
| Profit | 83,000 | 6,55,000 | 29,43,000 |

**(ii) Statement Showing Profitability of Division- Y**

| **Particulars** | **External Demand 15,000 Components (₹)** | **External Demand 19,000 Components (₹)** | **External Demand 35,000 Components (₹)** |
|---|---|---|---|
| Selling Price *per unit* | 1,200.00 | 1,200.00 | 1,200.00 |
| *Less:* Variable Cost *per unit:* | 314.00 (₹157 × 2) | 371.20 (₹185.60 × 2) | 600.00 (₹300 × 2) |
| Component –X | | | |
| Others | 375.00 | 375.00 | 375.00 |
| Contribution *per unit* | 511.00 | 453.80 | 225.00 |
| No. of units | 10,000 | 10,000 | 10,000 |
| Total Contribution | 51,10,000 | 45,38,000 | 22,50,000 |
| *Less:* Fixed Cost | 13,50,000 | 13,50,000 | 13,50,000 |
| Profit | 37,60,000 | 31,88,000 | 9,00,000 |

**11.**

☞

Once the initial basic feasible solution is done, we have to do the optimality test. If it satisfy the condition that number of allocation is equal to m+n-1 where m= number of rows, n= number of columns. If allocation is less than m+n-1, then the problem shows degenerate situation. In that case we have to allocate an infinitely small quantity (e) in least cost and independent cell. Independent cells in Transportation Problems mean the cells which do not form a closed loop with occupied cells.

The table obtained after using VAM contains 4 occupied cells against the required number of 4 + 4 – 1 = 7, hence the solution is degenerate.

To remove degeneracy, a letter 'e' is placed in three independent cells. The problem for test of optimality is reproduced in table below:

| Contractors | Job P | Job Q | Job R | Job S |
|---|---|---|---|---|
| A | 112.50 e | 100.00 e | 127.50 | 167.50 1 |
| B | 142.50 | 105.00 1 | 157.50 | 137.50 |
| C | 122.50 e | 130.00 | 120.00 1 | 160.00 |
| D | 102.50 1 | 112.50 | 150.00 | 137.50 |

☞

Alternatively, **'e'** can also be allocated to cell $C_{42}$ instead of $C_{11}$.

Now total number of allocations become equal to m + n -1 i.e. 7. This solution is tested for optimality.

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

| | | | | | $u_i$ |
|---|---|---|---|---|---|
| | 112.50 | 100.00 | 110.00 | 167.50 | 0 |
| | 117.50 | 105.00 | 115.00 | 172.50 | 5.00 |
| | 122.50 | 110.00 | 120.00 | 177.50 | 10.00 |
| | 102.50 | 90.00 | 100.00 | 157.50 | -10.00 |
| $v_j$ | 112.50 | 100.00 | 110.00 | 167.50 | |

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

**$\Delta_{ij}$ Matrix**

| | | | |
|---|---|---|---|
| | | 17.50 | |
| 25.00 | | 42.50 | -35.00 |
| | 20.00 | | -17.50 |
| | 22.50 | 50.00 | -20.00 |

Since all values of $\Delta_{ij}$ are not positive, the solution given above is not optimal. Let us include the cell with highest negative $\Delta_{ij}$ which is $C_{24}$ as a basic cell and try to improve the solution. The reallocated solution is given below which is tested for optimality-

| | | | |
|---|---|---|---|
| e | e<br>+1 | | 1<br>-1 |
| | 1<br>-1 | | <br>+1 |
| e | | 1 | |
| 1 | | | |

Revised allocations (improved initial solution) are as follows-

| Contractors | Job P | Job Q | Job R | Job S |
|---|---|---|---|---|
| **A** | 112.50 e | 100.00 1 | 127.50 | 167.50 |
| **B** | 142.50 | 105.00 **e** | 157.50 | 137.50 1 |
| **C** | 122.50 e | 130.00 | 120.00 1 | 160.00 |
| **D** | 102.50 1 | 112.50 | 150.00 | 137.50 |

☞

Again there is a situation of degenracy to remove this situation a new **'e'** has been allocated to least cost independent cell **$C_{22}$**.

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

| | | | | $u_i$ |
|---|---|---|---|---|
| 112.50 | 100.00 | 110.00 | 132.50 | 0 |
| 117.50 | 105.00 | 115.00 | 137.50 | 5.00 |

| | | | | | |
|---|---|---|---|---|---|
| | 122.50 | 110.00 | 120.00 | 142.50 | 10.00 |
| | 102.50 | 90.00 | 100.00 | 122.50 | -10.00 |
| $v_j$ | 112.50 | 100.00 | 110.00 | 132.50 | |

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

**$\Delta_{ij}$ Matrix**

| | | | |
|---|---|---|---|
| | | 17.50 | 35.00 |
| 25.00 | | 42.50 | |
| | 20.00 | | 17.50 |
| | 22.50 | 50.00 | 15.00 |

Since all the entries in the above $\Delta_{ij}$ Matrix table are non-negative, this solution is optimal. The optimal assignment is given below-

| Contractor | Job | Cost of Project |
|---|---|---|
| A | Q | 100.00 |
| B | S | 137.50 |
| C | R | 120.00 |
| D | P | 102.50 |
| | Total | 460.00 |

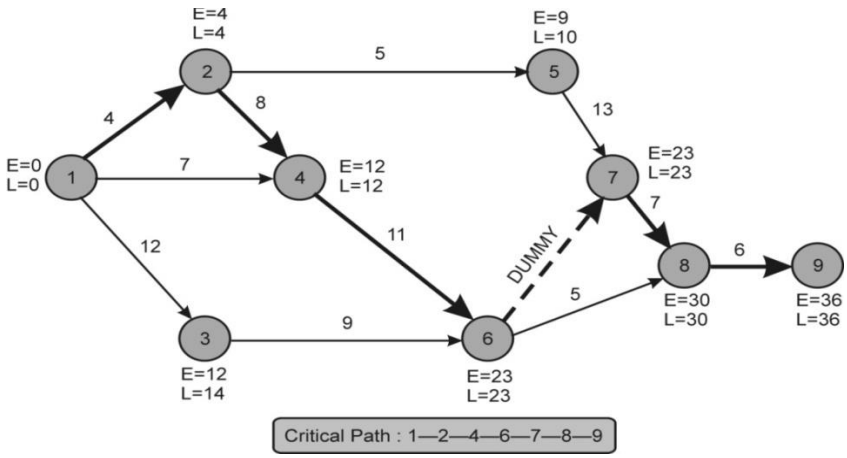
**12. (i) Calculation of Missing Figures**

**Statement Showing Calculation of Missing Figures**

| Activity | Duration | EST | EFT | LST | LFT | Total Float |
|---|---|---|---|---|---|---|
| | $D_{ij}$ | $E_i$ | $E_i + D_{ij}$ | $L_j - D_{ij}$ | $L_j$ | LST− EST |
| 1–2 | 4 | 0 | 4 | 0 | 4 | 0 |
| 1–3 | 12 | 0 | 12 | 2 | 14 | 2 |
| 1–4 | 7 | 0 | 7 | 5 | 12 | 5 |
| 2–4 | 8 | 4 | 12 | 4 | 12 | 0 |
| 2–5 | 5 | 4 | 9 | 5 | 10 | 1 |
| 3–6 | 9 | 12 | 21 | 14 | 23 | 2 |
| 4–6 | 11 | 12 | 23 | 12 | 23 | 0 |
| 5–7 | 13 | 9 | 22 | 10 | 23 | 1 |

| Activity | Duration | EST | EFT | LST | LFT | Total Float |
|---|---|---|---|---|---|---|
| | $D_{ij}$ | $E_i$ | $E_i + D_{ij}$ | $L_j - D_{ij}$ | $L_j$ | LST− EST |
| 6–7 | 0 | 23 | 23 | 23 | 23 | 0 |
| 6–8 | 5 | 23 | 28 | 25 | 30 | 2 |
| 7–8 | 7 | 23 | 30 | 23 | 30 | 0 |
| 8–9 | 6 | 30 | 36 | 30 | 36 | 0 |

**(ii) The Network for the given problem:**




**(iii) Paths with their corresponding durations**

The Various Paths in the Network are:

1–2–4–6–7–8–9 with Duration 36 Days

1–2–5–7–8–9 with Duration 35 Days

1–3–6–7–8–9 with Duration 34 Days

1–2–4–6–8–9 with Duration 34 Days

1–3–6–8–9 with Duration 32 Days

1–4–6–7–8–9 with Duration 31 Days

1–4–6–8–9 with Duration 29 Days

The Critical Path is 1–2–4–6–7–8–9 with Duration 36 Days.

**13. (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 do not 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 start time 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.

**14. Allocation of Random Numbers**

**Demand (units)**

| Units | Probability | Cumulative Probability | Random Nos. |
|---|---|---|---|
| 10,000 | 0.20 | 0.20 | 00 – 19 |
| 20,000 | 0.25 | 0.45 | 20 – 44 |
| 30,000 | 0.30 | 0.75 | 45 – 74 |
| 40,000 | 0.25 | 1.00 | 75 – 99 |

**Contribution per unit**

| ₹ | Probability | Cumulative Probability | Random Nos. |
|---|---|---|---|
| 25 | 0.25 | 0.25 | 00 – 24 |
| 35 | 0.30 | 0.55 | 25 – 54 |
| 45 | 0.35 | 0.90 | 55 – 89 |
| 55 | 0.10 | 1.00 | 90 – 99 |

**Advertising Cost**

| ₹ | Probability | Cumulative Probability | Random Nos. |
|---|---|---|---|
| 50,000 | 0.22 | 0.22 | 00 – 21 |
| 60,000 | 0.33 | 0.55 | 22 – 54 |
| 70,000 | 0.44 | 0.99 | 55 – 98 |
| 80,000 | 0.01 | 1.00 | 99 – 99 |

**Investment**

| ₹ | Probability | Cumulative Probability | Random Nos. |
|---|---|---|---|
| 50,00,000 | 0.10 | 0.10 | 00 – 09 |
| 55,00,000 | 0.30 | 0.40 | 10 – 39 |
| 60,00,000 | 0.45 | 0.85 | 40 – 84 |
| 65,00,000 | 0.15 | 1.00 | 85 – 99 |

**Simulation Table**

| Random Number | Demand Units | Contribution Per unit (₹) | Adv. Cost (₹) | Return (₹) | Investment (₹) | Return on Investment |
|---|---|---|---|---|---|---|
| 09, 24, 85, 07 | 10,000 | 25 | 70,000 | 1,80,000 | 50,00,000 | 3.60% |
| 84, 38, 16, 48 | 40,000 | 35 | 50,000 | 13,50,000 | 60,00,000 | 22.50% |
| 41, 73, 54, 57 | 20,000 | 45 | 60,000 | 8,40,000 | 60,00,000 | 14.00% |
| 92, 07, 99, 64 | 40,000 | 25 | 80,000 | 9,20,000 | 60,00,000 | 15.33% |
| 65, 04, 78, 72 | 30,000 | 25 | 70,000 | 6,80,000 | 60,00,000 | 11.33% |

**Highest Likely Return** is 22.50% relating to trial 2.

**15. Working Note**

**The usual learning curve model is**

$$y = ax^b$$

*Where*

y = Average time per unit for x units

a = Time required for first unit

x = Cumulative number of units produced

b = Learning coefficient

**W.N.1**

**Time required for first 15 units based on revised learning curve of 80%** (when the time required for the first unit is 10 hours)

$$y = 10 \times (15)^{-0.322}$$

$$\log y = \log 10 - 0.322 \times \log 15$$

$$\log y = \log 10 - 0.322 \times \log (5 \times 3)$$

$$\log y = \log 10 - 0.322 \times [\log 5 + \log 3]$$

$$\log y = 1 - 0.322 \times [0.69897 + 0.47712]$$

$$\log y = 0.6213$$

$$y = \text{antilog of } 0.6213$$

$$y = 4.181 \text{ hours}$$

$$\text{Total time for 15 units} = 15 \text{ units} \times 4.181 \text{ hours}$$

$$= 62.72 \text{ hours}$$

**Time required for first 14 units based on revised learning curve of 80%** (when the time required for the first unit is 10 hours)

$$y = 10 \times (14)^{-0.322}$$

$$\log y = \log 10 - 0.322 \times \log 14$$

$$\log y = \log 10 - 0.322 \times \log (2 \times 7)$$

$$\log y = \log 10 - 0.322 \times [\log 2 + \log 7]$$

$$\log y = 1 - 0.322 \times [0.3010 + 0.8451]$$

$$\log y = 0.63096$$

$$y = \text{antilog of } 0.63096$$

$$y = 4.275 \text{ hrs}$$

$$\text{Total time for 14 units} = 14 \text{ units} \times 4.275 \text{ hrs}$$

$$= 59.85 \text{ hrs}$$

**Time required for 25 units based on revised learning curve of 80%** (when the time required for the first unit is 10 hours)

Total time for first 15 units = 62.72 hrs

Total time for next 10 units = 28.70 hrs [(62.72 − 59.85) hours × 10 units]

Total time for 25 units = 62.72 hrs + 28.70 hrs

= 91.42 hrs

**W.N.2**

**Computation of Standard and Actual Rate**

Standard Rate = $\frac{₹1,19,288}{180.74 \text{ hrs.}}$

= ₹ 660.00 per hr.

Actual Rate = $\frac{₹79,704}{118.08 \text{ hrs.}}$

= ₹ 675.00 per hr.

**W.N.3**

**Computation of Variances**

Labour Rate Variance = Actual Hrs × (Std. Rate – Actual Rate)

= 118.08 hrs × (₹660.00 – ₹675.00) = ₹1,771.20 (A)

Labour Efficiency Variance = Std. Rate × (Std. Hrs – Actual Hrs)

= ₹660 × (91.42 hrs – 118.08 hrs)

= ₹17,595.60 (A)

**Statement of Reconciliation (Actual Figures Vs Budgeted Figures)**

| Particulars | ₹ |
|---|---|
| Actual Cost | 79,704.00 |
| *Less:* Labour Rate Variance (Adverse) | 1,771.20 |
| *Less:* Labour Efficiency Variance (Adverse) | 17,595.60 |
| Budgeted Labour Cost (Revised)* | 60,337.20 |

Budgeted Labour Cost (Revised)*

= Std. Hrs. × Std. Rate

= 91.42 hrs. × ₹660

= ₹ 60,337.20

**16. Statement Showing Change in Profit**

| Particulars | Large (₹) | Medium (₹) | Total (₹) |
|---|---|---|---|
| **I. Effect of Product Mix Changes** | | | |
| Revised Estimated Sales Quantity (Ratio 40:60) | 62,304 | 93,456 | 1,55,760 |
| Revised Estimated Sales Quantity (Ratio 50:50) | 77,880 | 77,880 | 1,55,760 |
| Difference in Sales Quantity | (15,576) | 15,576 | NIL |
| Contribution Effect Thereon @ ₹8.60 and ₹10.60 | (1,33,953.60) | 1,65,105.60 | **31,152** |

| | | | |
|---|---|---|---|
| **II Effect of Volume Change** | | | |
| Revised Estimate of Sales Quantity (50:50) | 77,880 | 77,880 | |
| Original Estimate of Sales Quantity (50:50) | 60,000 | 60,000 | |
| Difference in Sales Quantity | 17,880 | 17,880 | 35,760 |
| Contribution Effect Thereon @ ₹8 and ₹10 | 1,43,040 | 1,78,800 | **3,21,840** |
| **III. Effect of Price Change** | | | |
| Revised Estimate of Sales Quantity (Ratio 40:60) | 62,304 | 93,456 | 1,55,760 |
| Difference in Price p.u. | 0.60 | 0.60 | 0.60 |
| Contribution Effect | 37,382.40 | 56,073.60 | **93,456** |
| **IV. Effect of Expenses** | | | |
| Sales Promotion Expenses | | | **(78,000)** |
| Savings in Interest | | | **9,000** |
| **Overall Increase in Profit** | | | **3,77,448** |

Total Improvement in Profit ₹3,77,448 (11.51%).

**Workings**

**Budget for Original and Revised Contribution**

| Particulars | Original Budget Estimate | | Revised Estimate | |
|---|---|---|---|---|
| | Description | (₹) | Description | (₹) |
| Market- Sales Quantity | 12,00,000 units | | 14,16,000 | |
| Company's Share | 1,20,000 units (10% of total) | | 1,55,760 units (11% of total) | |
| **Sales Quantity** | | | | |
| Large | 60,000 units (50% of mix) | | 62,304 (40% of mix) | |
| Medium | 60,000 units (50% of mix) | | 93,456 (60% of mix) | |
| **Contribution Earned** | | | | |
| Large | 60,000 units × ₹8 | 4,80,000 | 62,304 units × ₹8.60 | 5,35,814.40 |
| Medium | 60,000 units × ₹10 | 6,00,000 | 93,456 units × ₹10.60 | 9,90,633.60 |
| **Effect of Expenses** | | | | |
| Sales Promotion | | --- | | -78,000 |
| Interest | | --- | | 9,000 |
| Revised Contribution | | 10,80,000 | | 14,57,448 |

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This question can also be solved by computing Sales Contribution Price Variance, Sales Contribution Mix Variance, Market Size Variance, Market Share Variance.

## PAPER – 5: ADVANCED MANAGEMENT ACCOUNTING

## QUESTIONS

### Activity Based Costing

1. Bank of NZ operated for years under the assumption that profitability can be increased by increasing Rupee volumes. But that has not been the case. Cost analysis has revealed the following:

| Activity | Activity Cost (₹) | Activity Driver | Activity Capacity |
|---|---|---|---|
| Providing ATM Service | 1,00,000 | No. of Transactions | 2,00,000 |
| Computer Processing | 10,00,000 | No. of Transactions | 25,00,000 |
| Issuing Statements | 8,00,000 | No. of Statements | 5,00,000 |
| Customer Inquiries | 3,60,000 | Telephone Minutes | 6,00,000 |

The following annual information on three products was also made available:

| Activity Driver | Checking Accounts | Personal Loans | Gold Visa |
|---|---|---|---|
| Units of Product | 30,000 | 5,000 | 10,000 |
| ATM Transactions | 1,80,000 | 0 | 20,000 |
| Computer Transactions | 20,00,000 | 2,00,000 | 3,00,000 |
| Number of Statements | 3,00,000 | 50,000 | 1,50,000 |
| Telephone Minutes | 3,50,000 | 90,000 | 1,60,000 |

***Required***

(i) Calculate rates for each activity.

(ii) Using the rates computed in requirement (i), calculate the cost of each product.

### Value Added/ Non -Value Added Activities

2. Queensland Furniture (QF) manufactures high-quality wooden doors within the forests of Queensland since 1919. Management is having emphasize on creativity, engineering, innovation and experience to provide customers with the door they desire, whether it is a standard design or a one-of-a-kind custom door. The following information pertains to operations during Jan:

| | | | |
|---|---|---|---|
| Processing time | 9.0 hrs.* | Waiting time | 6.0 hrs.* |
| Inspection time | 1.5 hr.* | Move time | 7.5 hrs.* |
| Units per batch | 60 units | | |

*(*) average time per batch*

***Required***

Compute the following operational measures:

(i) Average non-value-added time per batch

(ii) Average value added time per batch

(iii) Manufacturing cycle efficiency

(iv) Manufacturing cycle time

**Shut Down or Continue**

3. If AICI Limited operates its plant at normal capacity it produces 2,00,000 units from the plant 'C'. The unit cost of manufacturing at normal capacity is as under:

| | ₹ |
|---|---|
| Direct material…… | ...65 |
| Direct labour…… | ..30 |
| Variable overhead…… | ..33 |
| Fixed overhead…… | ...7 |
| | 135 |

Direct labour cost represents the compensation to highly-skilled workers, who are permanent employees of the company. The company cannot afford to lose them. One labour hour is required to complete one unit of the product.

The company sells its product for ₹ 200 per unit with variable selling expenses of ₹ 16 per unit. The company estimates that due to economic down turn, it will not be able to operate the plant at the normal capacity, at least during the next year. It is evaluating the feasibility of shutting down the plant temporarily for one year.

If it shuts down the plant, the fixed manufacturing overhead will be reduced to ₹ 1,25,000. The overhead costs are incurred at a uniform rate throughout the year. It is also estimated that the additional cost of shutting down will be ₹ 50,000 and the cost of re-opening will be ₹ 1,00,000.

***Requiredf***

Calculate the minimum level of production at which it will be economically beneficial to continue to operate the plant next year if 50% of the labour hours can be utilized in another activity, which is expected to contribute at the rate of ₹ 40 per labour hour. The additional activity will relate to a job which will be off-loaded by a sister company only if the company decides to shut down the plant.

(Assume that the cost structure will remain unchanged next year. Ignore income tax and time value of money)

**Labour Related Decision**

4. If DBC Ltd. is producing a component called 'DBC'. Estimated costs are:

| | Fixed Cost per year (₹ '000) | Variable Cost per 'DBC' (₹) |
|---|---|---|
| Production | 32,000 | 3,600 |
| Distribution | 2,000 | 200 |

Direct labour costs are 40% of the variable production costs. In the production department machining and assembling of 'DBC', 90 men work 8 hours per day for 300 days in a year. Each worker can machine and assemble 1 'DBC' per uninterrupted 180 minutes time frame. In each 8 hours working day, 20 minutes are allowed for coffee-break, 30 minutes on an average for training and 22 minutes for supervisory instructions. Besides 10% of each day is booked as idle time to cover checking in and checking out changing operations, getting materials and other miscellaneous matters.

DBC Ltd. has been facing industrial relations problem as the workers of company have a very strong union. Company is faced with the possibility of a strike by direct production workers engaged on the assembly of 'DBC'. The trade union is demanding an increase of 15%, back-dated from the beginning of financial year, but the company expects that if a strike does take place, it will last 25 Days after which the union will settle for an increase of 10% similarly back-dated. The only product of the company is being sold at ₹ 6,000.

If the strike takes place, Sales of 1,300 'DBC' would be lost. The balance that would ordinarily have been produced during the strike period could, however be sold, but these 'DBC' would have to be made up in overtime working which would be at an efficiency rate of 90% of normal. This would entail additional fixed cost of ₹1,00,000 and wage payments at time and one-half.

***Required***

Give necessary advice to the management to allow the strike to go ahead or to accept the union's demand.

**Sales or Further Processing Decision**

5. If A process industry unit manufactures three joint products: L, B and G. G has no realisable value unless it undergoes further processing after the point of separation. The cost details of G are as follows:

| | p.u. |
|---|---|
| | ₹ |
| Upto point of separation | |
| Marginal cost…….... | 30 |

| | |
|---|---|
| Fixed Cost…… | 20 |
| After point of separation | |
| Marginal cost……..…….. | 15 |
| Fixed cost…… | 5 |
| | 70 |

G can be sold at ₹ 37 per unit and no more.

***Required***

(i) Would you recommend production of G?

(ii) Would your recommendation be different if L, B and G are not joint products?

**CVP Analysis**

6. The profit for the year of Garena Ltd. works out to 12.5% of the capital employed and the relevant figures are as under:

| | |
|---|---|
| Sales…… | ₹ 5,00,000 |
| Direct Materials…… | ₹ 2,50,000 |
| Direct Labour…….. | ₹ 1,00,000 |
| Variable Overheads…….. | ₹ 40,000 |
| Capital Employed…… | ₹ 4,00,000 |

The new Sales Manager who has joined the company recently estimates for next year a profit of about 23% on capital employed, provided the volume of sales is increased by 10% and simultaneously there is an increase in Selling Price of 4% and an overall cost reduction in all the elements of cost by 2%.

***Required***

Find out by computing in detail the cost and profit for next year, whether the proposal of Sales Manager can be adopted.

**Cost Plus/ Mark-up Pricing**

7. JTC Ltd. is specialists in the manufacture of sports goods. They manufacture croquet mallets but purchase the wooden balls, iron arches and stakes required to complete a croquet set.

Mallets consist of a head and handle. Handles use 2.5 board feet per handle at ₹ 50 per board foot. Spoilage loss is negligible for the manufacture of handles. Heads frequently split and create considerable scrap.

A head requires 0.40 board feet of high quality lumber costing ₹ 60 per board foot. Spoilage normally works out to 20% of the completed heads. 4% of the spoiled heads can be salvaged and sold as scrap at ₹ 10 per spoiled head.

In the department machining and assembling the mallets, 6 men work 8 hours per day for 25 days in a month. Each worker can machine and assemble 12 mallets per uninterrupted 40 minutes time frame. In each 8 hours working day, 15 minutes are allowed for coffee-break, 8 minutes on an average for training and 9 minutes for supervisory instructions. Besides 10% of each day is booked as idle time to cover checking in and checking out changing operations, getting materials and other miscellaneous matters. Workers are paid at a comprehensive rate of ₹ 6 per hour.

The department is geared to produce 20,000 mallets per month and the monthly expenses of the department are as under:

| | (₹) |
|---|---|
| Finishing and painting of the mallets | 20,000 |
| Lubricating oil for cutting machines | 600 |
| Depreciation for cutting machine | 1,400 |
| Repairs and maintenance | 200 |
| Power to run the machines | 400 |
| Plant Manager's salary | 9,400 |
| Other overheads allocated to the department | 60,000 |

***Required***

As the mallets are machined and assembled in lots of 250, prepare a total cost sheet for one lot and advise the management on the selling price to be fixed per mallet in order to ensure a minimum 33.33% margin on the selling price.

**Return on Investment Pricing**

8. The cost of production and sales of 80,000 units per annum of product 'I' are:

| | | | |
|---|---|---|---|
| Material | ₹ 4,80,000 | Labour | ₹ 1,60,000 |
| Variable Overhead | ₹ 3,20,000 | Fixed overhead | ₹ 5,00,000 |

The fixed portion of capital employed is ₹12 lacs and the varying portion is 50% of sales turnover.

***Required***

Determine the selling price per unit to earn a return of 12% net on capital employed (net of Tax @ 40%).

**Profit Maximisation Model**

9. APV Ltd. has developed a new product which is about to be launched into the market. The variable cost of selling the product is ₹ 17 per unit. The marketing department has

estimated that at a sale price of ₹ 25, annual demand would be 10,000 units. However, if the sale price is set above ₹ 25, sales demand would fall by 500 units for each ₹ 0.50 increase above ₹ 25. Similarly, if the price is below ₹ 25, demand would increase by 500 units for each ₹ 0.50 stepped reduction in price below ₹ 25.

***Required***

Determine the price which would maximise APV Ltd.'s profit in the next year.

**Break Even Point (Batches)**

10. BOSH India 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:

| | B | O | S | H | |
|---|---|---|---|---|---|
| Sales (units) | 2,00,000 | 2,60,000 | 1,60,000 | 3,00,000 | **Total** |
| | (₹) | (₹) | (₹) | (₹) | (₹) |
| 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:

B……..10,00,000

O……..……1,00,000

S…….. 2,00,000

H……..1,00,000 ……..14,00,000

General fixed overheads……..……. 6,20,000

31,00,000

The other information is as follows:

| | B | O | S | H | 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***

(i) Prepare a profitability statement that is more useful for decision making than the profit statement prepared by BOSH India Ltd.

(ii) Calculate the break-even volume in batches and also in approximate units for Product 'B'.

**Pricing Strategy**

11. State the appropriate pricing policy in each of the following independent situations:

(i) 'W' is a new product for the company and the market and meant for large scale production and long term survival in the market. Demand is expected to be elastic.

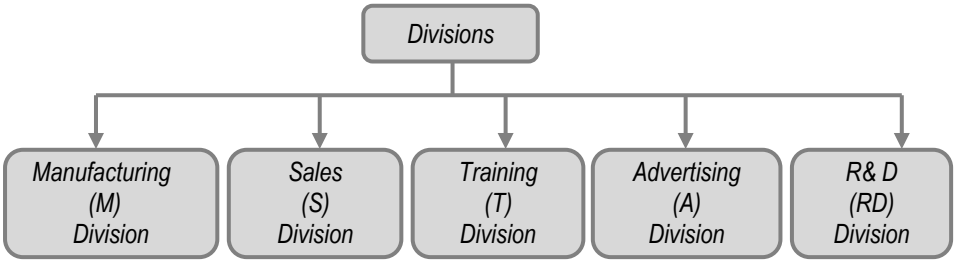
(ii) 'X' is a new product for the company, but not for the market. X's success is crucial for the company's survival in the long term.

(iii) 'Y' is a new product to the company and the market. It has an inelastic market. There needs to be an assured profit to cover high initial costs and the usual sources of capital have uncertainties blocking them.

(iv) 'Z' is a perishable item, with more than 80% of its shelf life over.

**Budget – Zero Based Budgeting**

12. Air Communication Limited is a state-owned large public company in the telecommunications sector. One of its main planning and control tools is the preparation and use of traditional annual budgets. Its divisional structure is as under:




Division T, A and RD incur substantial amount on discretionary expenses.

***Required***

Identify the possibilities of introducing a Zero Based Budgeting system for Division T, A and RD.

**Budget – Missing Figure**

13. Following information are extracted from monthly budgets of JIT Ltd.

| | November | December |
|---|---|---|
| Beginning WIP Inventory | 36,000 | ??? |
| Beginning Finished Goods Inventory | 44,000 | ??? |
| Variable Cost of Goods Sold | 1,23,000 | ??? |
| Direct Material Usage | 50,000 | 56,000 |
| Direct Labour | 53,100 | 69,000 |
| Variable Overhead | 25,000 | 29,000 |
| Variable Cost of Goods Manufactured | 1,09,000 | 1,14,800 |
| Ending WIP Inventory | ??? | ??? |
| Ending Finished Goods Inventory | ??? | 45,000 |

***Required***

Find out missing figures.

**Standard Costing – Profit Reconciliation**

14. ANZ Ltd. has provided the following summarized results for two years:

| | Year ended (₹ In lacs) | |
|---|---|---|
| | 31-03-2016 | 31-3-2017 |
| Sales | 3,000 | 3,277.50 |
| Material | 2,000 | 2,357.50 |
| Variable overheads | 500 | 525.00 |

| | | |
|---|---|---|
| Fixed overheads | 300 | 367.50 |
| Profit | 200 | 27.50 |

During the year ended 31-3-2017 sale price has increased by 15% whereas material and overhead prices have increased by 15% and 5% respectively.

***Required***

(i) Analyse the variances of revenue and each element of cost over the year in order to bring out the reasons for the change in profit.

(ii) Present a profit reconciliation statement starting from profits in 2015-16 showing the factors responsible for the change in profits in 2016-17.

*Note – Consider 'Contribution Variances' for solving this question.*

**Standard Costing**

15. Natural Spices manufactures and distributes high-quality spices to gourmet food shops and top quality restaurants. Gourmet and high-end restaurants pride themselves on using the freshest, highest-quality ingredients.

Natural Spices has set up five state of the art plants for meeting the ever growing demand. The firm procures raw material directly from the centers of produce to maintain uniform taste and quality. The raw material is first cleaned, dried and tested with the help of special machines. It is then carefully grounded into the finished product passing through various stages and packaged at the firm's ultraclean factory before being dispatched to customers.

The following variances pertain to last week of operations, arose as a consequence of management's decision to lower prices to increase volume.

| | |
|---|---|
| Sales Volume Variance | 18,000 (F) |
| Sales Price Variance | 14,000 (A) |
| Purchase Price Variance | 10,000 (F) |
| Labour Efficiency Variance | 11,200 (F) |
| Fixed Cost Expenditure Variance | 4,400 (F) |

***Required***

(i) Identify the 'Critical Success Factors' for Natural Spices.

(ii) Evaluate the management's decision with the 'Overall Corporate Strategy' and 'Critical Success Factors'.

16. Great Southern Company Ltd. has two Divisions namely Casnub Bogie Division (CBD) and Wagon Division (WD). CBD manufactures Casnub Bogies and WD manufactures BOBN type of Wagons. To manufacture a Wagon WD needs four Casnub Bogies. CBD is

the only manufacturer of the Casnub Bogies and supplies both WD and outside customers. Details of CBD and WD for the coming financial year 2017-18 are as follows:

| | CBD | WD |
|---|---|---|
| Fixed Costs (₹) | 9,20,20,000 | 16,45,36,000 |
| Variable Cost per unit (₹) | 2,20,000 | 4,80,000* |
| Capacity per month (units) | 320 | 12 |

* excluding transfer costs

Market research has indicated that the demands in the market for Great Southern Company Ltd.'s products at different quotations are as follows:

For Casnub Bogies: Quotation price of ₹ 3,20,000 no tender will be awarded, but demand will increase by 30 Casnub Bogies with every ₹ 10,000 reduction in the unit quotation price below ₹ 3,20,000.

For Wagons: Quotation price of ₹ 17,10,000 no tender will be awarded, but the demand for Wagons will be increased by two Wagons with every ₹ 50,000 reduction in the unit quotation price below ₹ 17,10,000.

***Required***

(i) Calculate the unit quotation price of the Wagon that will maximise Great Southern Company Ltd.'s profit for the financial year 2017-18.

(ii) Calculate the unit quotation price of the Wagon that is likely to emerge if the divisional managers of CBD and WD both set quotation prices calculated to maximise divisional profit from sales to outside customers and the transfer price is set at market selling (quotation) price.

*[Note: If $P = a - bQ$ then $MR = a - 2bQ$]*

**Balanced Scorecard**

17. Classify the following measures under appropriate categories in a Balanced Scorecard for a banking company which excels in its home loan products:

(i) A new product related to life insurance is being considered for a tie up with the successful housing loan disbursements.

e.g. every housing loan applicant to be advised to take a life policy or compelled to take a fire insurance policy.

(ii) How different sectors of housing loans with different interest rates have been sanctioned, their volumes of growth in the past 4 quarters.

(iii) How many days are taken to service a loan, how many loans have taken longer, what additional loans are to be released soon, etc.

**Linear Programming – Formulation**

18. The owner of Fancy Goods Shop is interested to determine, how many advertisements to release in the selected three magazines M, N and O. His main purpose is to advertise in such a way that total exposure to principal buyers of his gods is maximized. Percentages of readers for each magazine are known. Exposure in any particular magazine is the number of advertisements released multiplied by the number of principal buyers. The following data are available:

| Particulars | Magazines | | |
|---|---|---|---|
| | M | N | O |
| Readers | 1.0 Lakhs | 0.6 Lakhs | 0.4 Lakhs |
| Principal buyers | 20% | 15% | 8% |
| Cost per advertisement | ₹ 8,000 | ₹ 6,000 | ₹ 5,000 |

The budgeted amount is at the most ₹1.0 lakh for the advertisements. The owner has already decided that magazine M should have no more than 15 advertisements and that N and O each gets at least 8 advertisements.

***Required***

Formulate a Linear Programming model for this problem.

**Assignment Problem – Minimisation**

19. A factory is going to modify of a plant layout to install four new machines $X_1$, $X_2$, $X_3$ and $X_4$. There are 5 vacant places P, Q, R, S and T available. Because of limited space machine $X_2$ cannot be placed at R and $X_3$ cannot be placed at P. The cost of locating machine to place in Rupees is shown below:

(₹)

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 18 | 22 | 30 | 20 | 22 |
| $X_2$ | 24 | 18 | -- | 20 | 18 |
| $X_3$ | -- | 22 | 28 | 22 | 14 |
| $X_4$ | 28 | 16 | 24 | 14 | 16 |

***Required***

Determine the optimal assignment schedule in such a manner that the total costs are kept at a minimum.

**Missing Figures & Network**

20. The number of days of total float (TF), earliest start times (EST) and duration in days are given for some of the following activities.

| Activity | TF | EST | Duration |
|---|---|---|---|
| 1–2 | 0 | 0 | ??? |
| 1–3 | 2 | ??? | ??? |
| 1–4 | 5 | ??? | ??? |
| 2–4 | 0 | 4 | ??? |
| 2–5 | 1 | ??? | 5 |
| 3–6 | 2 | 12 | ??? |
| 4–6 | 0 | 12 | ??? |
| 5–7 | 1 | ??? | ??? |
| 6–7 | ??? | 23 | ??? |
| 6–8 | 2 | ??? | ??? |
| 7–8 | 0 | 23 | ??? |
| 8–9 | ??? | 30 | 6 |

***Required***

(i) Find the??? Figures.

(ii) Draw the network.

(iii) List the paths with their corresponding durations and state when the project can be completed.

21. 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**

22. T Aviation Ltd, supplier of automation systems and equipment, has just invented a new part 'T'. New part has a budgeted total profit of ₹ 75,000 from the first 256 parts. The time taken to produce the first part was 112.50 hours. The labour rate is ₹ 20 per hour. A 90% learning curve is expected to apply indefinitely.

***Required***

Calculate the sensitivity of the budgeted total profit from the first 256 parts to changes in the learning rate.

**Miscellaneous**

23. Indicate 6 activity drivers in respect of each of the following activity cost pools:
    (i) Human Resources Cost
    (ii) Accounting Costs
24. Which of the following statements are VALID in respect of flexible budgeting.
    (i) A flexible budget is one which changes from year to year.
    (ii) It is a budget which departmental heads can change at will.
    (iii) It is a system of budgeting which will recast the budgets because of a change in fixed expenses.
    (iv) It is a system of budgeting under which budgets are recast quickly for changes in the volume of activity.
    (v) It involves careful differentiation between fixed and variable expenses.
25. State whether the following statements are VALID or INVALID.
    (i) When price reductions are introduced to increase sales revenue, the revenue line will be a straight line.
    (ii) In fixing selling prices, volume consideration should be taken into account so that fuller utilisation of plant capacity is achieved.
    (iii) There is no price policy in perfect competition.
    (iv) The rate of return to be earned by factory should cover the risk involved in business.
    (v) Survival and progress of a firm depend on its ability to maintain and replace, whenever necessary, its fixed assets.

## SUGGESTED ANSWERS/HINTS

**1.** **Statement Showing "Activity Rate"**

| Activity | Activity Cost [a] (₹) | Activity Driver | No. of Units of Activity Driver [b] | Activity Rate [a] / [b] (₹) |
|---|---|---|---|---|
| Providing ATM Service | 1,00,000 | No. of ATM Transactions | 2,00,000 | 0.50 |
| Computer Processing | 10,00,000 | No. of Computer Transactions | 25,00,000 | 0.40 |
| Issuing Statements | 8,00,000 | No. of Statements | 5,00,000 | 1.60 |
| Customer Inquiries | 3,60,000 | Telephone Minutes | 6,00,000 | 0.60 |

**Statement Showing "Cost of Product"**

| Activity | Checking Accounts (₹) | Personal Loans (₹) | Gold Visa (₹) |
|---|---|---|---|
| Providing ATM Service | 90,000 (1,80,000 tr.×₹ 0.50) | --- | 10,000 (20,000 tr. × ₹ 0.50) |
| Computer Processing | 8,00,000 (20,00,000 tr. × ₹ 0.40) | 80,000 (2,00,000 tr. × ₹ 0.40) | 1,20,000 (3,00,000 tr. × ₹ 0.40) |
| Issuing Statements | 4,80,000 (3,00,000 st. × ₹ 1.60) | 80,000 (50,000 st. × ₹ 1.60) | 2,40,000 (1,50,000 st. × ₹ 1.60) |
| Customer Inquiries | 2,10,000 (3,50,000 min. × ₹ 0.60) | 54,000 (90,000 min. × ₹ 0.60) | 96,000 (1,60,000 min. × ₹ 0.60) |
| Total Cost [a] | ₹ 15,80,000 | ₹ 2,14,000 | ₹ 4,66,000 |
| Units of Product [b] | 30,000 | 5,000 | 10,000 |
| Cost of each Product [a] / [b] | 52.67 | 42.80 | 46.60 |

**2.** **(i)** Average Non Value Added Time *per batch*

= Inspection Time + Waiting Time + Move Time

= 1.5 hr. + 6.0 hrs. + 7.5 hrs.

= 15 hrs.

**(ii)** Average Value Added Time per batch

= Processing Time

= 9 hrs.

**(iii)** Manufacturing Cycle Efficiency

$$= \frac{\text{Processing Time}}{\text{Processing Time + Inspection Time + Waiting Time + Move Time}}$$

$$= \frac{9.0 \text{ hrs.}}{9.0 \text{ hrs.} + 1.5 \text{ hr.} + 6.0 \text{ hrs.} + 7.5 \text{ hrs.}}$$

$$= 37.5\%$$

**(iv)** Manufacturing Cycle Time

$$= \frac{\text{Total Production Time}}{\text{Units per Batch}}$$

$$= \frac{24 \text{ hrs.}}{60 \text{ units}}$$

$$= 0.40 \text{ hrs. } \textit{per unit}$$

**3. Contribution *per unit***

| **Particulars** | **(₹)** |
|---|---|
| Selling Price | 200 |
| Variable Cost (₹ 65 + ₹ 33 + ₹ 16) | 114 |
| Contribution per unit (Excluding direct labour, considered irrelevant and fixed) | 86 |

**Savings and Earnings if the Plant is Shut Down**

| **Particulars** | **(₹)** |
|---|---|
| Savings in Fixed Cost (₹ 14,00,000* – ₹ 1,25,000) | 12,75,000 |
| Contribution from Alternate Activity (₹ 40 × 50% of 2,00,000 hrs) | 40,00,000 |
| Shutting Down and Reopening Cost (₹ 50,000 + ₹100,000) | (1,50,000) |
| Total | 51,25,000 |

* [2,00,000 units x ₹ 7]

Indifference Point: ₹ 51,25,000 / ₹ 86 = 59,593 units

Minimum level of production to justify continuation = 59,594 units

**4. Alternative-1 with No Strike:** (Refer W.N.-2, 3)

Cost of Settlement is 15% Increase i.e. ₹ 216 per unit

Annual Cost of Settlement

= 54,000 units × ₹ 216

= ₹ 1,16,64,000

**Alternative 2 i.e. if Strike Goes Ahead:** (Refer W.N.-1, 2, 3)

| **Extra Cost** | **(₹)** |
|---|---|
| Annual Incremental Labour Cost (Ex. Strike Days Production) [{54,000 units – (25Days × 180 units per Day)} × ₹144.00] | 71,28,000 |
| Loss of Contribution *due to loss of sales* [1,300 units × ₹ 2,200] | 28,60,000 |
| Incremental Labour Cost for Balance 3,200 units [(25 Days × 180 units per Day) – 1,300 units} × ₹144.00] | 4,60,800 |
| Overtime Premium [3,200 units × 1,584 × 0.5] | 25,34,400 |
| Payment for Efficiency [3,200 units × 1/9 × 1,584 × 1.5] | 8,44,800 |
| Additional Fixed Cost | 1,00,000 |
| | 1,39,28,000 |

If there is no strike, it will yield a financial benefit of ₹ 22,64,000 (₹ 1,39,28,000 – ₹ 1,16,64,000). Management should accept union's demand.

**Working Note**

**(1) Statement Showing Contribution *per unit* of 'DBC'**

| | **(₹)** |
|---|---|
| Selling Price | 6,000 |
| *Less:* Variable Costs: | |
| Labour Cost | 1,440 |
| Production Ex. Wages (₹3,600 – ₹1,440) | 2,160 |
| Distribution | 200 |
| Contribution | 2,200 |

**(2) Calculation of Labour Cost**

| | | |
|---|---|---|
| Direct Labour (40% of production costs of ₹3,600) | = | ₹1,440 *per unit* |
| With 15% Increase, Revised Labour Cost (₹1,440 + ₹216) | = | ₹1,656 |
| With 10% Increase, Revised Labour Cost (₹1,440 + ₹144) | = | ₹1,584 |

**(3) Statement Showing Budgeted Production**

| | | |
|---|---|---|
| Total Time in a Day: (8hrs. × 60 minutes) | = | 480 minutes |
| *Less:* Idle Time | = | 48 minutes |
| Coffee Break | = | 20 minutes |
| Instructions | = | 22 minutes |

| | | |
|---|---|---|
| Training | = | 30 minutes |
| Productive Time *per day* | = | 360 minutes |

Therefore, 'DBC' to be produced per man per day: (360/180 × 1) = 2 units

Since 'DBC' are produced at the rate of 2 'DBC' per man day, so total yearly production will be 54,000 units (2 units × 90 men × 300 days) of 'DBC'

☞

This problem has been solved by comparing **'Existing Situation'** with both **'Alternatives (Strike or Non-Strike)'** *independently*. However, this problem can also be solved by comparing **'Alternatives (Strike or Non-Strike)'** *only* and final answer would be the same. Students may also solve this problem by taking **'Total Approach'** instead of **'Incremental Approach'**.

**5. (i)** Cost incurred on Product 'G' *upto point of separation* is irrelevant for decision making as Product 'G' is a Joint Product. Joint Products are the result of same raw material & same process Operations.

Cost incurred *after point of separation* will be considered for decision making as *specifically* incurred for Product 'G'.

After further processing Product 'G' will *contribute* ₹17 per unit toward 'Joint Production Cost'.

Calculation is as follows

| Particulars | Amount (₹) |
|---|---|
| Selling Price *per unit* | 37.00 |
| *Less:* Cost after separation: | |
| Marginal Cost *per unit* | 15.00 |
| Fixed Cost *per unit* | 5.00 |
| Contribution toward 'Joint Production Cost' | |

Hence, *further processing* of Product 'G' is recommended.

**(ii)** If Product 'G' is not a joint product with same cost structure. In this case there will be *negative contribution* on production of Product 'G'. The calculation is as follows→

| Particulars | Amount (₹) |
|---|---|
| Selling Price *per unit* | 37.00 |
| *Less:* Marginal Cost (₹ 30 + ₹ 15) | 45.00 |
| Contribution | (8.00) |

Hence, production of Product 'G' will not be recommended.

**6. Statement Showing "Cost and Profit for the Next Year"**

| Particulars | Existing Volume, etc. | Volume, Costs, etc. after 10% Increase | Estimated Sale, Cost, Profit, etc.* |
|---|---|---|---|
| | (₹) | (₹) | (₹) |
| Sale | 5,00,000 | 5,50,000 | 5,72,000 |
| *Less:* Direct Materials | 2,50,000 | 2,75,000 | 2,69,500 |
| Direct Labour | 1,00,000 | 1,10,000 | 1,07,800 |
| Variable Overheads | 40,000 | 44,000 | 43,120 |
| Contribution | 1,10,000 | 1,21,000 | 1,51,580 |
| *Less:* Fixed Cost# | 60,000 | 60,000 | 58,800 |
| Profit | 50,000 | 61,000 | 92,780 |

**(*)** for the next year after increase in selling price @ 4% and overall cost reduction by 2%.

**(#)** Fixed Cost = Existing Sales – Existing Marginal Cost – 12.5% on ₹ 4,00,000

= ₹ 5,00,000 – ₹ 3,90,000 – ₹ 50,000

= ₹ 60,000

Percentage Profit on Capital Employed equals to 23.19% $\left(\frac{₹92,780}{₹4,00,000} \times 100\right)$

Since the Profit of ₹ 92,780 is more than 23% of capital employed, the proposal of the Sales Manager can be adopted.

**7. JTC Ltd.**

**Cost Sheet of One Lot of 250 Croquet Mallets**

| Computation of Total Cost: | (₹) |
|---|---|
| Direct Material | |
| Handles (2.5 feet × 250 units × ₹ 50) | 31,250 |
| Heads (1.20 × 250 × 0.40 × ₹ 60) [W.N.-1] | 7,200 |
| *Less:* Scrap Recovery (4% × 50 × ₹ 10) | (20) |
| Direct Labour (8 Hrs × ₹ 6 × 250 / 120) [W.N.-2] | 100 |
| Prime Cost | 38,530 |
| *Factory & Other Overheads* | |
| Variable, Finishing & Painting (20,000 × 250 / 20,000) [W.N.-3] | 250 |
| Fixed (₹ 72,000 × 250 / 18,000) [W.N.-4] | 1,000 |
| Total Cost | 39,780 |

| **Price Quotation:** | **(₹)** |
|---|---|
| Cost *per mallet* (₹39,780 / 250 Units) | 159.12 |
| *Add:* Profit (50% on Cost) | 79.56 |
| Selling Price | 238.68 |

**Working Notes**

**1.** Since 20% of completed heads are spoiled, output of 1 unit requires input of 1.20 units (1 + 0.20); so, total heads processed, 300 (1.20 × 250), of which spoiled heads are 50.

**2.**

| | | |
|---|---|---|
| Total Time *in a day* | (8 × 60) | 480 minutes |
| *Less*: Idle Time | 48 minutes | |
| Coffee Break | 15 minutes | |
| Instructions | 9 minutes | |
| Training | 8 minutes | 80 minutes |
| Productive Time *per day*: | | 400 minutes |

Therefore, mallets to be produced per man per day, 120 units (400/40 × 12).

Since mallets are produced at the rate of 120 mallets per man day, so total monthly production will be18,000 mallets (120 units × 6 men × 25 days).

**3.** Finishing and painting overheads are assumed to be variable for the production of 20,000 mallets.

**4.** All the other expenses are fixed and are to be absorbed by 18,000 (120 units × 6 men × 25 Days) mallets of monthly production.

**8.** Return of 12% Net (after tax of 40%) on Capital Employed is equivalent to 20% (Gross) [12% ÷ (1 – 0.4)] on Capital Employed.

Let Selling Price per unit to be 'K'

Since Total Sales = Total Cost + Profit

80,000 K = 14,60,000 + 20% (12,00,000 + 0.5 × 80,000K)

Or, 80,000 K = 14,60,000 + 2,40,000 + 8,000K

Or, 72,000 K = 17,00,000

Or, 'K' $= \frac{17,00,000}{72,000}$

= ₹ 23.61

Hence Selling Price per unit will be ₹ 23.61.

**9. 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) |
| 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 |
| 25.50 | 17.00 | 8.50 | 9,500 | 80,750 |
| **26.00** | **17.00** | **9.00** | **9,000** | **81,000** |
| 27.00 | 17.00 | 10.00 | 8,000 | 80,000 |
| 27.50 | 17.00 | 10.50 | 7,500 | 78,750 |

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.

☞

This problem can also be solve by using **'Profit Maximisation'** model formula.

**10. (i) Statement Showing "Profitability of BOSH India Ltd"**

| | Products (Amount in ₹) | | | | |
|---|---|---|---|---|---|
| | B | O | S | H | 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**

Total Sale Value of Product 'B' = ₹ 26,00,000

Total Contribution of Product 'B' = ₹ 9,40,000

Specific Fixed Overheads (Product 'B' ) = ₹ 10,00,000

$$\text{Break-even Sales (₹)} = \frac{\text{Specific Fixed Cost}}{\text{Total Contribution}} \times \text{Total Sales Value}$$

$$= \frac{₹\,10,00,000}{₹\,9,40,000} \times ₹26,00,000$$

$$= ₹\,27,65,957.45$$

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

$$= 2,12,766 \text{ units}$$

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 $\left(\frac{₹\,282.20}{₹\,13.00}\right)$.

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

Break-even units of product 'B' 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 | B | O | S | H |
|---|---|---|---|---|
| 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) |

**11.**

| | Situation | Appropriate Pricing Policy |
|---|---|---|
| (i) | 'W' is a new product for the company and the market and meant for large scale production and long term survival in the market. Demand is expected to be elastic. | Penetration Pricing |
| (ii) | 'X' is a new product for the company, but not for the market. X's success is crucial for the company's survival in the long term. | Market Price or Price Just Below Market Price |
| (iii) | 'Y' is a new product to the company and the market. It has an inelastic market. There needs to be an assured profit to cover high initial costs and the unusual sources of capital have uncertainties blocking them. | Skimming Pricing |
| (iv) | 'Z' is a perishable item, with more than 80% of its shelf life over. | Any Cash Realizable Value* |

*(*) this amount decreases every passing day.*

**12.** Discretionary costs are those that are incurred, typically each year, in an amount that is approved as part of the normal budget process. However, there is no clear relationship between the volume of services and the amount of cost that must be incurred. Manager must decide and justify the level that is deemed to be appropriate. This justification is to be made a fresh without making reference to previous level of spending in his/her department.

Zero based budgeting is undoubtedly most effective in terms of discretionary costs. The bottom line of a zero based budgeting is that it is important to understand what types of objectives are being accomplished by discretionary cost centers and what resources being devoted to accomplishing various objectives. This will allows a prioritization, so

that organization can evaluate the likely impact of substantial increase or decrease in the resources allocated to the discretionary center.

Accordingly, ZBB has extensive potential application to the division T, A and RD.

**13. Analysis of WIP Account**

| | November | December |
|---|---|---|
| Opening WIP | 36,000 | **55,100** |
| *Add:* Direct Materials Usage | 50,000 | 56,000 |
| *Add:* Direct Labor | 53,100 | 69,000 |
| *Add:* Variable Overhead | 25,000 | 29,000 |
| Total Inflow into WIP | 1,64,100 | 2,09,100 |
| *Less:* Variable Cost of Goods Manufactured | 1,09,000 | 1,14,800 |
| Ending WIP | **55,100** | **94,300** |

**Analysis of Finished Goods Inventory Account**

| | November | December |
|---|---|---|
| Opening Finished Goods | 44,000 | **30,000** |
| *Add:* Cost of Goods Manufactured | 1,09,000 | 1,14,800 |
| Cost of Goods Available for Sale | 1,53,000 | 1,44,800 |
| *Less:* Cost of Goods Sold | 1,23,000 | **99,800** |
| Ending Finished Goods Inventory | **30,000** | 45,000 |

**14. Statement Showing Reconciliation Between Budgeted [F.Y. 2015-16] & Actual Profit [F.Y. 2016-17]**

| Particulars | (₹ in lacs) | (₹ in lacs) |
|---|---|---|
| Budgeted Profit | | 200.00 |
| Sales Contribution Variances: | | |
| Price | 427.50 (F) | |
| Volume | 25 (A) | 402.50 (F) |
| Direct Material Variances: | | |
| Price | 307.50 (A) | |
| Usage | 150.00 (A) | 457.50 (A) |
| Variable Overheads Variances: | | |
| Expenditure | 25.00 (A) | |
| Efficiency | 25.00 (A) | 50.00 (A) |

| | | |
|---|---|---|
| Fixed Overheads Variances: | | |
| Expenditure | 67.50 (A) | |
| Volume | N.A. | 67.50 (A) |
| Actual Profit | | 27.50 |

**Computation of Variances (₹ In Lacs)**

**Sales Variances (W.N.1)**

**Price Variance** = Actual Sales – Standard Sales

= ₹ 3,277.50 – ₹ 2,850.00

= ₹ 427.50 (F)

**Volume Variance** = Standard Sales – Budgeted Sales

= ₹ 2,850.00 – ₹ 3,000.00

= ₹ 150 (A)

**Sales Contribution Variances**

**Sales Contribution Price Variance** = Sales Price Variance

= ₹ 427.50 (F)

**Sales Contribution Volume Variance** = Sales Volume Variance × Budgeted PV Ratio

$$= ₹\ 150\ (A) \times \left(\frac{₹\ 200 + ₹\ 300}{₹\ 3,000}\right)$$

= ₹ 25 (A)

**Material Variances (W.N.2)**

**Material Price Variance**

= Standard Cost of Actual Quantity – Actual Cost

= ₹ 2,050.00 – ₹ 2,357.50

= ₹ 307.50 (A)

**Material Usage Variance**

= Standard Cost of Standard Quantity for Actual Output – Standard Cost of Actual Quantity

= ₹ 1,900 – ₹ 2,050

= ₹ 150 (A)

**Variable Overhead Variances (W.N.3)**

**Expenditure Variance**

= Budgeted Variable Overheads for Actual Hours – Actual Variable Overheads

*Or*

= Std. Rate *per unit* × Expected Output for Actual Hours Worked – Actual Variable Overheads

= ₹ 500 – ₹ 525

= ₹ 25 (A)

**Efficiency Variances** = Standard Variable Overheads for Production – Budgeted Variable Overheads for Actual Hours

*Or*

= Std. Rate *per unit* × Actual Output – Std. Rate *per unit* × Expected Output for Actual Hours Worked

= ₹ 475 – ₹ 500

= ₹ 25 (A)

**Fixed Overhead Variances (W.N.4)**

**Expenditure Variance**

= Budgeted Fixed Overheads – Actual Fixed Overheads.

= ₹ 300.00 – ₹ 367.50

= ₹ 67.50 (A)

**Working Notes (₹ in lacs)**

**Note-1:**

| | |
|---|---|
| Sales in F.Y. 2016-2017 | 3,277.50 |
| *Less:* Increase due to *price rise* [₹ 3,277.50 lacs x 15/115] | 427.50 |
| Sales in F.Y. 2016-2017 at F.Y. 2015-2016 Prices **[Standard Sales]** | 2,850.00 |
| Sales in F.Y. 2015-2016 | 3,000.00 |
| Fall in Sales in F.Y. 2016-2017 [₹ 3,000 lacs - ₹ 2,850 lacs] | 150.00 |
| Percentage fall | 5% |

**Note-2:**

| | |
|---|---|
| Material Cost in F.Y. 2015-2016 | 2,000.00 |
| *Less:* 5% for Decrease in Volume | 100.00 |
| 'Standard Material Usage' at F.Y. 2015-16 Prices **(Standard Cost of Standard Quantity for Actual output)** | 1,900.00 |
| Actual Material Cost F.Y. 2016-2017 | 2,357.50 |
| *Less:* 15% Increase in Prices [₹ 2,357.50 lakhs x 15/115] | 307.50 |
| Actual Materials Used, at F.Y. 2015-2016 Prices **(Standard Cost of Actual Quantity)** | 2,050.00 |

**Note-3:**

| | |
|---|---|
| Variable Overheads Cost in F.Y. 2015-16 | 500.00 |
| *Less:* 5% due to fall in Volume of Sales in F.Y. 2016-17 | 25.00 |
| **"Standard Overheads for Production"** in F.Y. 2016-17 | 475.00 |
| Actual Variable Overheads Incurred in F.Y. 2016-17 | 525.00 |
| *Less:* 5% for Increase in Price [₹ 525 lacs x 5 / 105] | 25.00 |
| Amount Spent in F.Y. 2016 -17 at F.Y. 2015-16 Prices **(Budgeted Variable Overheads for Actual Hours)** | 500.00 |

**15. (i)** Gourmet and high-end restaurants recognises Natural Spices on the basis of its *high quality* of spices. Therefore, quality is most critical success factor of Natural Spices. There are other factors which cannot be ignore such as price, delivery options, attractive packing etc. But all are secondary to the quality.

**(ii)** Deliberate action of cutting price to increase sales volume indicates that firm is intending to expand its market to retail market and street shops which is price sensitive.

*Purchase Price Variance* is clearly indicating that firm has purchased raw material at lower price which may be due to buying of lower quality of material. Similarly positive *Efficiency Variance* is indicating cost cutting and stretching resources.

It appears that firm is intending to expand its market to retail market and street shops by not only reducing the price but also compromising its quality which is opposing its current strategy of *high quality*.

Management should monitor the trends of variances on regular basis and take appropriate action in case of evidence of permanent decline in quality. Here, customer feedback is also very important.

**16. (i)** Assumed Quotation Price 'P', Quantity 'Q'

The Marginal Cost of a 'Wagon' is ₹ 13,60,000

(₹ 2,20,000 × 4 Casnub Bogies + ₹ 4,80,000)

*Demand Function for a 'Wagon'*

| | | |
|---|---|---|
| P | = | ₹ 17,10,000 – (₹50,000 / 2) × Q |
| Revenue (R) | = | Q × [17,10,000 – 25,000 × Q] |
| | = | 17,10,000 Q – 25,000 $Q^2$ |
| Marginal Revenue (MR) | = | 17,10,000 – 50,000 Q |
| Marginal Cost (MC) | = | 13,60,000 |

*Profit is Maximum where Marginal Revenue (MR) equals to Marginal Cost (MC)*

| | | |
|---|---|---|
| 17,10,000 – 50,000 Q | = | 13,60,000 |
| Q | = | 7.00 units |

By putting the value of 'Q' in *Demand Function*, value of 'P' is obtained.

| | | |
|---|---|---|
| P | = | 17,10,000 – (50,000/ 2) × Q |
| | = | 17,10,000 – 25,000 × 7.00 |
| | = | ₹ 15,35,000 |

At ₹15,35,000 unit Quotation Price of a Wagon the Great Southern Company Ltd.'s Profit will be Maximum.

**(ii)** At CBD the Divisional Manager would ensure that Divisional Marginal Revenue should be ***equal to*** Division's Marginal Cost so that Profit can be Maximum.

| | | |
|---|---|---|
| MR of a Casnub Bogies | = | MC of Manufacturing a Casnub Bogies |
| 3,20,000 – 2(10,000/ 30) × Q | = | 2,20,000 |
| Q | = | 150 units |

Selling Price of a Casnub Bogie 'P' is

| | | |
|---|---|---|
| P | = | 3,20,000 – (10,000/ 30) × 150 |
| | = | ₹ 2,70,000 |

CBD will earn Maximum Profit when it will Quote ₹ 2,70,000 to the Outside Market.

Since, Outside Market Quotation is *Transfer Price* as well, so Transfer Price to WD will be ₹ 2,70,000 and it forms part of WD's Marginal Cost.

At WD, Division Manager would ensure that Divisional Marginal Revenue should be ***equal to*** Division's Marginal Cost so that Profit can be Maximum.

| | | |
|---|---|---|
| MR of a Wagon | = | MC of Manufacturing a Wagon |

17,10,000 – 50,000 × Q = (₹ 2,70,000 × 4 Casnub Bogies) + ₹ 4,80,000

Q = 3.00 units

Quotation Price of a Wagon 'P' should be:

P = ₹ 17,10,000 – 25,000 × 3.00

= ₹ 16,35,000

The unit Quotation Price of Wagon that emerges as a result of Market Based Transfer Pricing is ₹16,35,000.

**17.** (i) New Product *tie up* --- Innovation / Learning Perspective

(ii) Growth of Volume --- Financial Perspective

(iii) Time for Loan / Fresh Products --- Customer Perspective

**18.** Let $x_1$, $x_2$ and $x_3$ denote the number of advertisements to be released in three magazines M, N and O respectively. Let Z denote the total exposure to the principal buyers of the goods.

Objective function:

Since the exposure in any magazine is the number of advertisements multiplied by the number of principal buyers, therefore, the value of Z is given by:

$Z = (0.20 \times 1,00,000)\, x_1 + (0.15 \times 60,000)\, x_2 + (0.08 \times 40,000)\, x_3$

$= 20,000x_1 + 9,000x_2 + 3,200x_3$

Constraints:

The budgeted amount for the advertisements is at the most ₹1,00,000

Hence, $8,000x_1 + 6,000x_2 + 5,000x_3 \leq 1,00,000$

Also, the magazine M should have no more than 15 advertisements, N and O each should get at least 8 advertisements.

Hence, $x_1 \leq 15$,

$x_2 \geq 8$ and

$x_3 \geq 8$

The linear programming model for the problem:

Maximise

$Z = 20,000x_1 + 9,000x_2 + 3,200x_3$

*Subject to the Constraints:*

$8,000x_1 + 6,000x_2 + 5,000x_3 \leq 1,00,000$

| | | | |
|---|---|---|---|
| | $x_1$ | ≤ | 15 |
| | $x_2$ | ≥ | 8 |
| | $x_3$ | ≥ | 8 |
| Where | $x_1$, $x_2$ and $x_3$ | ≥ | 0 |

**19.** Dummy machine ($X_5$) is inserted to make it a balanced cost matrix and assume its installation cost to be zero. Cost of install at cell $X_3$ (P) and $X_2$ (R) is very high marked as M.

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| **$X_1$** | 18 | 22 | 30 | 20 | 22 |
| **$X_2$** | 24 | 18 | M | 20 | 18 |
| **$X_3$** | M | 22 | 28 | 22 | 14 |
| **$X_4$** | 28 | 16 | 24 | 14 | 16 |
| **$X_5$ (Dummy)** | 0 | 0 | 0 | 0 | 0 |

**Step 1**

Subtract the minimum element of each row from each element of that row-

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| **$X_1$** | 0 | 4 | 12 | 2 | 4 |
| **$X_2$** | 6 | 0 | M | 2 | 0 |
| **$X_3$** | M | 8 | 14 | 8 | 0 |
| **$X_4$** | 14 | 2 | 10 | 0 | 2 |
| **$X_5$ (Dummy)** | 0 | 0 | 0 | 0 | 0 |

**Step 2**

Subtract the minimum element of each column from each element of that column-

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| **$X_1$** | 0 | 4 | 12 | 2 | 4 |
| **$X_2$** | 6 | 0 | M | 2 | 0 |
| **$X_3$** | M | 8 | 14 | 8 | 0 |
| **$X_4$** | 14 | 2 | 10 | 0 | 2 |
| **$X_5$ (Dummy)** | 0 | 0 | 0 | 0 | 0 |

**Step 3**

Draw lines to connect the zeros as under-

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 0 | 4 | 12 | 2 | 4 |
| $X_2$ | 6 | 0 | M | 2 | 0 |
| $X_3$ | M | 8 | 14 | 8 | 0 |
| $X_4$ | 14 | 2 | 10 | 0 | 2 |
| $X_5$ (Dummy) | 0 | 0 | 0 | 0 | 0 |

There are five lines which are equal to the order of the matrix. Hence the solution is optimal. We may proceed to make the assignment as under-

| | P | Q | R | S | T |
|---|---|---|---|---|---|
| $X_1$ | 0 | 4 | 12 | 2 | 4 |
| $X_2$ | 6 | 0 | M | 2 | 0 |
| $X_3$ | M | 8 | 14 | 8 | 0 |
| $X_4$ | 14 | 2 | 10 | 0 | 2 |
| $X_5$ (Dummy) | 0 | 0 | 0 | 0 | 0 |

The following is the assignment which keeps the total cost at minimum-

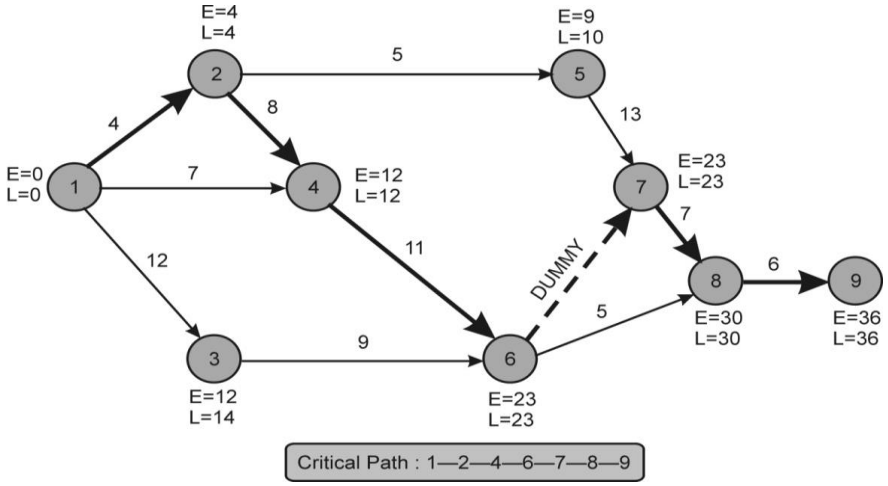
| Machines | Location | Costs (₹) |
|---|---|---|
| $X_1$ | P | 18 |
| $X_2$ | Q | 18 |
| $X_3$ | T | 14 |
| $X_4$ | S | 14 |
| $X_5$ (Dummy) | R | 0 |
| | Total | 64 |

**20.** (i) Calculation of **Missing Figures**:

| Activity | Duration | EST | EFT | LST | LFT | Total Float |
|---|---|---|---|---|---|---|
| | $D_{ij}$ | $E_i$ | $E_i + D_{ij}$ | $L_j - D_{ij}$ | $L_j$ | LST− EST |
| 1–2 | 4 | 0 | 4 | 0 | 4 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1–3 | 12 | 0 | 12 | 2 | 14 | 2 |
| 1–4 | 7 | 0 | 7 | 5 | 12 | 5 |
| 2–4 | 8 | 4 | 12 | 4 | 12 | 0 |
| 2–5 | 5 | 4 | 9 | 5 | 10 | 1 |
| 3–6 | 9 | 12 | 21 | 14 | 23 | 2 |
| 4–6 | 11 | 12 | 23 | 12 | 23 | 0 |
| 5–7 | 13 | 9 | 22 | 10 | 23 | 1 |
| 6–7 | 0 | 23 | 23 | 23 | 23 | 0 |
| 6–8 | 5 | 23 | 28 | 25 | 30 | 2 |
| 7–8 | 7 | 23 | 30 | 23 | 30 | 0 |
| 8–9 | 6 | 30 | 36 | 30 | 36 | 0 |

**(ii)** The **Network** for the given problem:




**(iii)** The **Various Paths** in the Network are:

1–2–4–6–7–8–9 with Duration 36 Days

1–2–5–7–8–9 with Duration 35 Days

1–3–6–7–8–9 with Duration 34 Days

1–2–4–6–8–9 with Duration 34 Days

1–3–6–8–9 with Duration 32 Days

1–4–6–7–8–9 with Duration 31 Days

1–4–6–8–9 with Duration 29 Days

**(iv)** The **Critical Path** is 1–2–4–6–7–8–9 with Duration 36 Days.

**21. 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** |

**22.** (i) Cumulative Average Time for 256 parts = 48.43 hrs.*
[112.50 × $(0.90^8)$]

Total Time for 256 parts = 12,398.08 hrs.
[48.43 hrs.× 256 parts]

Total Labour Cost of 256 parts = ₹ 2,47,961.60
[12,398.08 hrs.× ₹ 20]

Revised Labour Cost for *zero profit* = ₹ 3,22,961.60
[₹ 2,47,961.60 + ₹ 75,000]

Total Time for 256 parts (Revised) = 16,148.08 hrs.
[₹ 3,22,961.60/₹ 20]

Cumulative Average Time for 256 parts (Rev.)= 63.08 hrs.
[16,148.08/256]

The usual learning curve model is

$y = ax^b$

*Where*

y = Cumulative Average Time per part for x parts

a = Time required for first part

x = Cumulative number of parts

b = Learning coefficient (log r/log 2)

*Accordingly*

$\Rightarrow$ 63.08 = $112.50\times (256)^{b}$

$\Rightarrow$ 0.5607 = $2^{8b}$

$\Rightarrow$ log 0.5607 = log $2^{8b}$

$\Rightarrow$ log 0.5607 = $8 \times b \times \log 2$

$\Rightarrow$ log 0.5607 = $8 \times \frac{\log r}{\log 2} \times \log 2$

$\Rightarrow$ log 0.5607 = 8 log r

$\Rightarrow$ log 0.5607 = log $r^{8}$

$\Rightarrow$ 0.5607 = $r^{8}$

$\Rightarrow$ r = $\sqrt[8]{0.5607}$

$\Rightarrow$ r = 0.9302

Learning Rate (r) = 93.02%.

Therefore

Sensitivity = 3.02/90

= 3.36%

☞

Students may also take 48.38 hrs. (112.50 × 0.43)

**23.** (i)

| | | |
|---|---|---|
| Human Resource Cost | 1. | Number of employee |
| | 2. | Number of training Hours |
| | 3. | Number of benefit changes |
| | 4. | Number of insurance claims |
| | 5. | Number of pension changes |
| | 6. | Number of recruiting contacts |

(ii)

| | |
|---|---|
| Accounting Cost | 1. Number of billings |
| | 2. Number of cash receipts |
| | 3. Number of check payments |
| | 4. Number of general ledger entries |
| | 5. Number of reports issued |
| | 6. Number of responsibility centre |

**24.** (i) Invalid

(ii) Invalid

(iii) Invalid

(iv) Valid

(v) Valid

**25.** (i) Invalid

(ii) Valid

(iii) Valid

(iv) Valid

(v) Valid