PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

QUESTIONS

Budget & Budgetary Control – Raw Material Purchase Budget, Raw Material Consumption Budget and Production Budget

1. A single product company estimated its sales for the next year quarter wise as under:

Quarter	Sales Units
I	60,000
II	75,000
III	82,500
IV	90,000

The opening stock of finished goods is 20,000 units and the company expects to maintain the closing stock of finished goods at 32,500 units at the end of the year. The production pattern in each quarter is based on 80% of the sales of the current quarter and 20% of the sales of the next quarter.

The opening stock of raw materials in the beginning of the year is 20,000 Kg. and the closing stock at the end of the year is required to be maintained at 10,000 Kg. Each unit of finished output required 2 Kg. of raw materials.

The company proposes to purchase the entire annual requirement of raw materials in the first three quarters in the proportion and at the prices given below:

Quarter	Purchase of raw materials % total annual requirement in quantity	Price per Kg. (₹)
I	30%	2
II	50%	3
III	20%	4

The value of the opening stock of raw materials in the beginning of the year is ₹ 40,000.

You are required to present the following for the next year, quarter wise:

(i) Production budget in units.

(ii) Raw material consumption budget in quantity.

(iii) Raw material purchase budget in quantity and value.

Budget & Budgetary Control – Material Purchase Budget and Wages Budget

2. SIAM Ltd. manufactures two products using one type of material and one grade of labour. Shown below is an extract from the company's working papers for the next period's budget.

Particulars	Product A	Product B
Budgeted Sales (Units)	1,800	2,400
Budgeted Material Consumption per Product (Kg.)	5	3
[Budgeted Material Cost ₹12 per Kg.]		
Standard Hours Allowed per product	5	4
[Budgeted Wage Rate ₹8 per hour]		

Overtime premium is 50% and is payable, if a worker works for more than 40 hours a week. There are 45 direct workers.

The target productivity ratio (or efficiency ratio) for the productive hours worked by the direct workers in actually manufacturing the products is 80%; in addition the non-productive downtime is budgeted at 20% of the productive hours worked.

There are twelve 5-day weeks in the budget period and it is anticipated that sales and production will occur evenly throughout the whole period.

It is anticipated that stock at the beginning of the period will be:

Product A 510 units; Product B 1,200 units; Raw material 2,150 Kg.

The target closing stock, expressed in terms of anticipated activity during budget period are - Product A 15 days sales; Product B 20 days sales; Raw material 10 days consumption.

Required:

(a) the material purchases budget, and

(b) the wages budget for the direct workers, showing the quantities and values, for the next period.

Standard Costing – Material, Labour & Overhead Variances

3. Thomson Exports Ltd. manufactures readymade shirts of a specific quantity in lots to each special order from its overseas customers.

The Standard Costs for one dozen of shirts are:

	₹
Direct Material (24metres @ ₹ 22)	528
Direct Labour (3 hours @ ₹ 98)	294
Overheads (3 hours @ ₹ 80)	240

During July, 2013 it worked on three orders, for which the month's job cost records show the following:

Lot No.	Units	Materials used	Hours worked
245 (UK)	1,700 Doz.	40,440 Metres	5,130
246 (US)	1,200 Doz.	28,825 Metres	2,890
247 (HK)	1,000 Doz.	24,100 Metres	2,980

Additional information:

(a) The company bought 95,000 metres of materials during July at a cost of ₹ 21,28,000. The material price variance is recorded when materials are purchased. All inventories are carried at cost.

(b) Direct labour during July, 2013 amounted to ₹11,00,000, labour were paid at ₹ 100 per hour.

(c) Overheads during the month amounted to ₹9,12,000.

(d) A total of ₹1,15,20,000 was budgeted for overheads for the year 2013-14, based on estimated production of the plant's normal capacity of 48,000 dozen shirts annually. Overheads at the level of production is 40% fixed and 60% variable. Overheads is applied on the basis of direct labour hours.

(e) There was no work in progress at the beginning of July. During July, lot nos. 245 and 247 were completed. All materials were issued for lot no. 246 which was 80% complete as regards conversion.

Required:

(i) Computation of standard cost of production of the shirts per dozen as well as in total for lot Nos. 245, 246 and 247.

(ii) Find out the variation in quantity of material used and labour hours worked for each lot as well as in total.

(iii) Calculate the material price variance; labour rate variance; variable overheads efficiency variance and fixed overheads volume variance.

Decision Making – Make or Buy

4. Jupiter Ltd, a 'Fast-Moving Consumer Goods (FMCG)' company intends to diversify the product line to achieve full utilisation of its plant capacity. As a result of considerable research made, the company has been able to develop a new product called 'EXE'.

'EXE' is packed in *cans* of 100 ml capacity and is sold to the wholesalers in cartons of 24 *cans* at ₹120 per carton. Since the company uses its spare capacity for the manufacture of 'EXE', no additional fixed expenses will be incurred. However accountant has allocated

a share of ₹1,12,500 per month as fixed expenses to be absorbed by 'EXE' as a fair share of the company's present fixed costs to the new product for costing purposes.

The company estimates the production and sale of 'EXE' at 1,50,000 *cans* per month and on this basis the following cost estimates (per carton) have been developed:

	₹
Direct Materials	54
Direct Wages	36
All Overheads	27
Total Costs	117

After a detailed market survey the economy is confident that the production and sales of 'EXE' can be increased to 1,75,000 *cans* per month and ultimately to 2,25,000 *cans* per month.

The company at present has a capacity for the manufacture of 1,50,000 empty *cans* and the cost of the empty *cans* if purchased from outside will result in a saving of 20% in material and 10% in other costs of 'EXE'. The price at which the outside firm is willing to supply the empty *cans* is ₹ 0.675 per empty *can*. If the company desires to manufacture empty *cans* in excess of 1,50,000 *cans*, a machine involving an additional fixed overhead of ₹ 7,500 per month will have to be installed.

Required:–

(a) State by showing your workings whether the company should make or buy the empty *cans* at each of the three volumes of production of 'EXE' namely, 1,50,000, 1,75,000 and 2,25,000 *cans*.

(b) At what volume of sales will it be economical for the company to install the additional equipment for the manufacture of empty *cans*?

(c) Evaluate the profitability on the sale of 'EXE' at each of the aforesaid three levels of output based on your decision and showing the cost of empty *cans* as a separate element of cost.

Assignment Problem – Maximization of Revenue

5. Imagine yourself to be the Executive Director of a 5-Star Hotel which has four banquet halls that can be used for all functions including weddings. The halls were all about the same size and the facilities in each hall differed. During a heavy marriage season, 4 parties approached you to reserve a hall for the marriage to be celebrated on the same day. These marriage parties were told that the first choice among these 4 halls would cost ₹ 25,000 for the day. They were also required to indicate the second, third and fourth preferences and the price that they would be willing to pay. Marriage party A & D indicated that they won't be interested in Halls 3 & 4. Other particulars are given in the following table:

Revenue/Hall

Marriage Party	Hall 1	Hall 2	Hall 3	Hall 4
A	₹25,000	₹22,500	X	X
B	₹20,000	₹25,000	₹20,000	₹12,500
C	₹17,500	₹25,000	₹15,000	₹20,000
D	₹25,000	₹20,000	X	X

Where X indicates that the party does not want that hall. Decide on an allocation that will maximize the revenue to your hotel.

Transportation Problem - Maximization of Revenue

6. Q & A 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. Transfer Pricing Assignment will take 143 hours, Corporate Valuation will take 154 hours, and Statutory Audit will take 176 hours. The amount per hour that can be billed for assigning each manager to each assignment is given below:

Manager	Assignment		
	Transfer Pricing (₹)	Corporate Valuation (₹)	Statutory Audit (₹)
Peter	1,800	2,250	2,850
Johns	2,100	1,950	1,800
Albert	2,400	2,100	2,250

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.

Linear Programming –Primal & Dual

7. Find the dual problem for the following:

Minimize

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

Subject to the constraints

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

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

$7x_1 - 2x_2 - 4x_3 \leq 10$

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

$2x_1 + 5x_2 - 3x_3 = 3$

$x_1, x_2, x_3 \geq 0$

Life Cycle Costing, Target Costing & Learning Curve

8. Great Eastern Appliances Ltd. (GEAL) manufactures consumer durable products in a very highly competitive market. GEAL is considering launching a new product 'Kitchen Care' 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

   GEAL 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 250^{th} unit.

   You are required to-

   (i) Calculate the expected total labour hours over the life time of the product 'Kitchen Care'.

   (ii) Profitability of product 'Kitchen Care' that GEAL will earn over the life time of the product.

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

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

Customer Profitability Analysis

9. Edward Ltd. manufactures weighing machines of standard size and sells its products to two industrial customers namely MT Ltd. and KG Ltd. and to a dealer MG Bros. having shops in different cities. The maximum retail price per unit of weighing machine is ₹ 11,000 and per unit average cost of production is ₹ 5,500 (40% is general fixed overhead cost).

   The Finance Officer has been asked to undertake a customer profitability analysis and calculate and compare the profit margin per customer (before deducting general fixed overhead) to know about the real customer profitability.

Following are the additional overhead information:

Delivery costs	₹ 200 per kilometer
Emergency delivery cost (in addition to delivery cost)	₹ 21,000 per delivery
Order processing cost	₹ 6,000 per order
Specific discount and sales commission	As per negotiation
Product Advertisement cost	Actual cost

The following data are available for each customer

Particulars	MT Ltd.	KG Ltd.	MG Bros.
Sales (in units)	2,000	1,000	800
Total delivery kilometer travelled	1,000	800	900
No. of emergency delivery	2	1	0
No. of orders processed	4	2	8
Specific Discount (percentage of sales revenue)	25%	20%	15%
Sales Commission (percentage of sales revenue)	15%	10%	5%
Advertisement Costs (₹)	8,75,000	6,15,000	4,30,000

You are required to analyse the profitability for each customer, which customer is the most profitable.

Transfer Pricing

10. KL Ltd. has two divisions Division A and Division B. Division A produces product Z, which it sells to external market and also to Division B. Divisions in the KL 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 A 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 A incurs ₹ 1,600 as variable cost per unit and total fixed overhead of ₹ 4,00,00,000. Division A 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 A has been given a profit target of ₹ 2,50,00,000 for the year.

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

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

Required:

(i) Calculate the transfer price per unit of product Z that Division A should quote in order to meet target profit for the year.

(ii) Calculate the two prices Division A would have to quote to Division B, if it became KL Ltd. policy to quote transfer prices based on opportunity costs.

Standard Costing - Planning and Operational Variances

11. Managing Director of Petro-KL Ltd (PTKLL) thinks that Standard Costing has little to offer in the reporting of material variances due to frequently change in price of materials.

PTKLL can utilize one of two equally suitable raw materials and always plan to utilize the raw material which will lead to cheapest total production costs. However PTKLL is frequently trapped by price changes and the material actually used often provides, after the event, to have been more expensive than the alternative which was originally rejected.

During last accounting period, to produce a unit of 'P' PTKLL could use either 2.50 Kg of 'PG' or 2.50 kg of 'PD'. PTKLL planned to use 'PG' as it appeared it would be cheaper of the two and plans were based on a cost of 'PG' of ₹ 1.50 per Kg. Due to market movements the actual prices changed and if PTKLL had purchased efficiently the cost would have been:

'PG' ₹ 2.25 per Kg;

'PD' ₹ 2.00 per Kg

Production of 'P' was 1,000 units and usage of 'PG' amounted to 2,700 Kg at a total cost of ₹ 6,480/-

You are required to analyze the material variance for 'P' by:

(i) Traditional Variance Analysis; and

(ii) An approach which distinguishes between Planning and Operational Variances.

Standard Costing – Calculation of Variances with Application of Learning Curve

12. Genting Mfg Co. has developed a product for which the following standard cost estimates have been made for the first batch to be manufactured in Jan'13:

	₹
Direct Materials (100 Kgs. @ ₹ 55 per Kg.)	5,500
Direct Labour (100 hours @ ₹ 40 per hour)	4,000
Variable Overhead (100 hours @ ₹ 75 per hour)	7,500
	17,000

From experience the firm knows that labour will benefit from a learning effect and labour time will be reduced. This is expected to approximate to an 80% learning curve. In addition, the growing expertise of labour is expected to improve the efficiency with which materials are used. The usage of materials is expected to approximate to a 95% learning curve.

The actual production for Jan'13 to Jun'13 was 320 batches. During Jun'13 following results were recorded for the 320th batch made:

Direct Materials (80 Kgs.)	₹ 4,000
Direct Wages (20 hours)	₹ 1,000
Variable Overhead	₹ 1,800

You are required to calculate variances in connection with 320th batch.

[Note: Learning Coefficient is -0.322 and -0.074 for learning rate of 80% and 95% respectively, log2=0.30103, log5=0.69897, log319=2.50379, Antilog of 1.81462 =65.26, Antilog of 1.81472 =65.27, Antilog of 1.19334 =15.61, Antilog of 1.19378 =15.62]

Budget & Budgetary Control - Projection of Inventory with Re-Order Level

13. Bintan-Indo Manufacturers Ltd. (BIML) is specialist in the manufacturing of Industrial Products. They manufacture and market two types of products under the name 'X' and 'Y'. Company produces two products from three basic raw materials 'A', 'B', and 'C'. Company follows a 13-period reporting cycle for budgeting purpose. Each period is four weeks long and has 20 working days. Data relating to the purchase of raw materials are presented below:

Raw Material	Purchase Price (Per Kg)	Standard Purchase Lot (Kg)	Reorder Point (Kg)	Projected Inventory Status *at the end of 5th period* (Kg)		Lead Time in Working Days
				On Hand	On Order	
A	₹ 1.00	90,000	72,000	96,000	90,000	10
B	₹ 2.00	30,000	45,000	54,000	-	25
C	₹ 1.00	60,000	60,000	84,000	60,000	20

Past experience has shown that adequate inventory levels for 'X' and 'Y' can be maintained if 40 percent of the next period's projected sales are on hand at the end of a reporting period. Other relevant information is as follows:

Product	Raw Material Specifications			Projected Inventory Levels	Projected Sales		
	A	B	C	At the end of	6th	7th	8th

				current (5th) period	Period	Period	Period
	Kg	Kg	Kg	Units	Units	Units	Units
X	1.25	0.50	-	18,000	45,000	52,500	57,000
Y	2.00	-	1.50	16,800	42,000	27,000	24,000

The sales of 'X' and 'Y' do not vary significantly from month to month. Consequently, the safety stock incorporated into the reorder point for each of the raw materials in adequate to compensate for variations in the sales of the finished products.

Raw materials orders are placed the day the quantity on hand falls below the reorder point. BIML's suppliers are very trustworthy so that the given lead times are reliable.

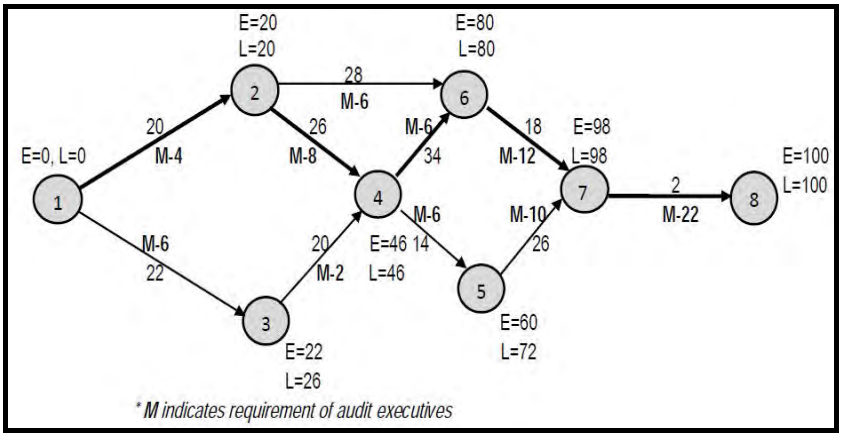
The outstanding orders for raw materials 'A' and 'C' are due to arrive on the 10th and 4th working day of the 6th period, respectively. Payments for all raw material orders are remitted by the 10th day of the delivery.

You are required to determine the following items for raw materials 'A', 'B', and 'C' for inclusion in the 6th period report to management:

1. Projected quantities (in Kg) to be issued to production.
2. Projected quantities (in Kg) ordered and the date (in terms of working days) the order is to be placed.
3. The projected inventory balance (in Kg) at the end of the period.
4. The payments for purchases with due date.

Program Evaluation and Review Technique – Duration & Resource Constraint

14. Rearrange the activities suitably for leveling the audit executives with the help of *time scale diagram* if during first 52 days only 8 to 10 audit executives and during remaining days 16 to 22 audit executives can be made available.



Balanced Scorecard

15. "Hard Rock Coconut" is an exclusive resort located in a famous Island of Pacific Ocean that vows to isolate its guests from the hustle and bustle of everyday life. Its leading principle is "all contemporary amenity wrapped in old-world charisma". Each of the resort's 18 villas has a separate theme like Castle, Majestic, Ambassador, Royal Chateau, Coconut, Lemon, Balinese etc and guests often ask for a specific villa when they make reservations. Villas are Ideal for families or friends travelling together and these villas feature luxurious accommodation spanning two floors. Since it is located within a 300-acre estate on white sand beach, the resort offers its guests a wide variety of outdoor activities such as horseback riding, hiking, diving, snorkeling, sailing, golf and so on. Guests could also while away the day relaxing in the pool and availing themselves of the resort's world-famous spa "Hard Coco Spa". The dining room, which only has three tables for the public, is acceptable proud of its 4-star rating.

    You are required to develop a balanced scorecard for "Hard Rock Coconut". It is sufficient to give two measures in each of the four perspectives.

Transfer Pricing – Optimum Decision Making Vs Performance Evaluation

16. Global Multinational Ltd. (GML) has two Divisions 'Dx' and 'Dz' with full profit responsibility. The Division 'Dx' produces Component 'X' which it sells to 'outside' customers only. The Division 'Dz' produces a product called the 'Z' which incorporates Component 'X' in its design. 'Dz' Division is currently purchasing required units of Component 'X' per year from an outside supplier at market price.

    New CEO for Indian Operations has explored that 'Dx' Division has enough capacity to meet entire requirements of Division 'Dz' and accordingly he requires internal transfer between the divisions at marginal cost from the overall company's perspective.

    Manager of Division 'Dx' claims that transfer at marginal cost are unsuitable for performance evaluation since they don't provide an incentive to the division to transfer goods internally. He stressed that transfer price should be 'Cost plus a Mark-Up'.

    New CEO worries that transfer price suggested by the manager of Division 'Dx' will not induce managers of both Divisions to make optimum decisions. You are requested to help him out of the problem.

Critical Path Analysis - Errors in Logical Sequencing

17. State the types of errors in logical sequencing may arise while drawing a network diagram?

Target Costing

18. "Target costing is less useful in situations where the majority of costs are not locked in during the design phase"-Explain with example.

Pricing of New Product

19. X Ltd. wants to enter in the market with a new product 'Gamma'. You are required to help management of X Ltd. in deciding pricing strategy if
    - Demand of the 'Gamma' is elastic,
    - Good possibility of substantial savings on large scale production and
    - There is threat of competition.

Miscellaneous

20. Write a short note on-
    (a) Inter-Firm Comparison
    (b) Simulation
    (c) Standard, ex post and ex ante
    (d) Six Sigma
    (e) Just-in-Time Production and Purchasing.

SUGGESTED ANSWERS/HINTS

1. Total Annual Production (In Units)

Particulars	Units
Sales in 4 Quarters	3,07,500
Add: Desired Closing Balance	32,500
	3,40,000
Less: Opening Balance	20,000
Total number of units to be produced in the next year	3,20,000

Production Budget (In Units)

Particulars	Q-I	Q-II	Q-III	Q-IV	Total
Sales	60,000	75,000	82,500	90,000	3,07,500
Production in Current Quarter (80% of the sale of current quarter)	48,000	60,000	66,000	72,000	
Production for Next Quarter (20% of the sale of next quarter)	15,000	16,500	18,000	24,500*	
Total Production	63,000	76,500	84,000	96,500*	3,20,000

*Difference in Balancing Figure

Raw Material Consumption Budget (In Quantity)

Particulars	Q-I	Q-II	Q-III	Q-IV	Total
Units to be produced in each quarter (1)	63,000	76,500	84,000	96,500	3,20,000
Raw material consumption per unit (Kg.) (2)	2	2	2	2	
Total raw material consumption Kg.) (1x2)	1,26,000	153,000	1,68,000	1,93,000	6,40,000

Raw Material Purchase Budget (In Quantity)

Particulars	Kg.
Raw material required for Production	6,40,000
Add: Desired Closing Balance of Raw Material	10,000
	6,50,000
Less: Opening Balance	20,000
Material to be purchased	6,30,000

Raw Material Purchase Budget (In Value)

Quarters (1)	% of Annual Requirement (Qty.) for Purchasing Raw Material (2)	Quantity of Raw Material to be Purchased (Kg.) (3)	Rate per Kg. (₹) (4)	Amount (₹) (5)=(3)x(4)
I	30	1,89,000 (6,30,000 x30%)	2	3,78,000
II	50	3,15,000 (6,30,000 x 50%)	3	9,45,000
III	20	1,26,000 (6,30,000 x 20%)	4	5,04,000
		6,30,000		18,27,000

2. Material Purchase Budget

(in quantities and value)

Particulars	Total
Material Consumption (Kg.) A (1,740 units x 5 Kg.= 8,700) B (2,000 units x 3 Kg.= 6,000)	14,700
Add: Closing Balance of Material (Kg.) (W.N. 3)	2,450
Less: Anticipated Opening Balance of Material (Kg.)	2,150
Total Quantity of Material (Kg.) to be purchased	15,000
Total Value of Material to be purchased (15,000 Kg. x ₹12)	₹1,80,000

Direct Workers Wages Budget

(showing hours required and wages paid)

Particulars	Total
Standard Hours for Budgeted Production A (1,740 units x 5 hrs.= 8,700) B (2,000 units x 4 hrs.= 8,000)	16,700
Standard Hours for Budgeted Production at Targeted Efficiency Ratio (W.N. 4)	20,875
Add: Non Productive Downtime (20% x 20,875 hours)	4,175
Total Labour Hours Required	25,050
Less: Normal Labour Hours (45 workers x 12 weeks x 5 days x 8 hours)	21,600
Difference (Overtime hours)	3,450
Wages for normal hours (21,600 hours x ₹ 8)	₹1,72,800
Overtime Wages (3,450 x ₹12)	₹41,400
Total Wages	₹2,14,200

Working Notes:

1. Computation of Closing Stock Balance of Products A and B

Budgeted Period of Sales (In days) = 12 weeks x 5 days = 60 days

Closing Stock of Product A (Units) (15 days sales)

$$= \frac{1{,}800 \text{ units} \times 15 \text{ days}}{60 \text{ days}} = 450 \text{ units}$$

Closing stock of Product B (units) (20 days sales)

$$= \frac{2{,}400 \text{ units} \times 20 \text{ days}}{60 \text{ days}} = 800 \text{ units}$$

2. Production Budget (Units)

Particulars	Products	
	A	B
Sales in units (60 days)	1,800	2,400
Add: Closing Stock (W.N. 1)	450	800
	2,250	3,200
Less : Anticipated Opening Balance	510	1,200
Total Number of Units to be produced	1,740	2,000

3. Closing Balance of Material (Kg.)

Closing Balance of Material (10 days consumption)

$$= \frac{14,700 \text{ kg}}{60 \text{ days}} \times 10 \text{ days} = 2,450 \text{ Kg.}$$

4. Standard Hours for Budgeted Production at targeted 80% efficiency ratio

$$= \frac{16,700 \text{ hrs.}}{80} \times 100 = 20,875 \text{ hrs.}$$

3. (i) Computation of Standard Cost of Production of the shirts per dozen as well as in total for Lot Nos. 245, 246, 247

Lot No.	Cost per dozen (₹)	Dozens	Total Standard Cost (₹)
245 (UK)	1,062#	1,700	18,05,400
246 (US)	955.20*	1,200	11,46,240
247 (HK)	1,062#	1,000	10,62,000
			40,13,640

Lot No. 245/247

100% as regards to material cost	₹ 528.00
100% as regards to conversion cost	₹ 534.00
	₹1,062.00

* Lot No. 246

100% as regards to material cost	₹528.00
80% as regards to conversion cost	₹427.20
	₹955.20

(ii) Statement of Variation between standard quantity of material and actual quantity of material used for each lot as well as in total

Lot Nos.	Output (In Dozens)	Std. Qty. Per Dozen (In Metre)	Total Std. Quantity (In Metres)	Total Actual Quantity (In Metres)	Variation (In Metres)
245 (UK)	1,700	24	40,800	40,440	360 (F)
246 (US)	1,200	24	28,800	28,825	25 (A)
247 (HK)	1,000	24	24,000	24,100	100 (A)
			93,600	93,365	235 (F)

Statement of Variation between standard labour hours and actual labour hours worked for each lot as well as in total

Lot Nos.	Output (In Dozens)	Std. Labour Hours Per Dozen	Total Std. Labour Hours	Total Actual Labour Hours	Variation (In Hours)
245 (UK)	1,700	3	5,100	5,130	30 (A)
246 (US)	1,200	3	2,880 (1,200 Doz x 3 Hrs. x 80%)	2,890	10 (A)
247 (HK)	1,000	3	3,000	2,980	20 (F)
			10,980	11,000	20 (A)

(iii) Calculation of Variances

Material Price Variance = Purchase Quantity x (Standard Price – Actual Price)

$$= 95{,}000 \text{ Metres } \times \left[₹\ 22 - \frac{₹\ 21{,}28{,}000}{95{,}000 \text{ Metres}}\right]$$

= ₹ 20,90,000 – ₹ 21,28,000

= ₹ 38,000(A)

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

= 11,000 Hrs.× (₹ 98 – ₹ 100)

= ₹ 22,000 (A)

Variable Overhead Efficiency Variance

= Std. Variable Overhead Rate *per hour** x

(Std. Hours for Actual Output – Actual Hours)

= ₹ 48 x (10,980 Hrs. – 11,000 Hrs.)

= ₹ 960 (A)

**Standard Variable Overhead Rate per hour = 60% of ₹80 = ₹48*

Fixed Overhead Volume Variance

= Std. Fixed Overhead Rate *per hour* ** x

(Std. Hrs. for Actual Output – Budgeted Hours)

= ₹ 32 x (10,980 Hrs. – 12,000 Hrs.)

= ₹ 32,640 (A)

***Standard fixed overhead rate per hour = 40% of ₹ 80 = ₹ 32*

4. Workings:

(1) All Overheads for one carton or 24*cans* ₹27

Therefore, per *can* Overheads (₹27/24) 1.125

Fixed Overheads Allocated for 1,50,000 *cans* ₹112,500

Per *can* Fixed Overheads (₹1,12,500 / 1,50,000 *cans)* ₹0.75

Variable Overheads per *can* (₹1.125 – ₹0.75) ₹0.375

(2) Direct Wage per carton ₹36

Per *can* (₹36/24) ₹1.50

(3) Direct Materials per carton ₹ 54

Per *can* (₹54/24) ₹2.25

(4) Cost of making one empty *can*:

	Cost per *can* of 'EXE' (₹)	Cost % empty *can*	Cost empty *can* (₹)	Cost of per *can* of 'EXE' without empty *can* (₹)
Direct Material	2.250	20	0.4500	1.8000
Direct Wages	1.500	10	0.1500	1.3500
Variable Overheads	0.375	10	0.0375	0.3375
Total	4.125		0.6375	3.4875

(5) Cost of manufacturing/buying of 1,50,000 empty *cans* of 'EXE':

	Empty *can* Cost (₹)	If empty *can* made (₹)	If empty *can* purchased (₹)
Direct Material	0.4500	67,500.00	-----
Direct Wages	0.1500	22,500.00	-----
Variable Overheads	0.0375	5,625.00	-----
Purchase Price	0.6750	-----	1,01,250.00
Total		95,625.00	1,01,250.00

Company should manufacture the empty *cans* for a production volume of 1,50,000 'EXE' *cans* as capacity is available and cost of manufacture is lower.

(6) After the level of 1,50,000 empty *cans*, the company has to install a new machine involving a total additional Fixed Overheads of ₹ 7,500. The cost of making and buying the additional *cans* of 25,000 and 75,000 will be as follows:

	Cost per *can* (₹)	Make (₹)	Buy (₹)	Make (₹)	Buy (₹)
		25,000 *cans*		75,000 *cans*	
Direct Material	0.4500	11,250.00	-----	33,750.00	-----
Direct Wages	0.1500	3,750.00	-----	11,250.00	-----
Variable Overheads	0.0375	937.50	-----	2,812.50	-----
Additional Overheads		7,500.00	-----	7,500.00	-----
Purchase Price	0.6750	-----	16,875.00	-----	50,625.00
Total		23,437.50	16,875.00	55,312.50	50,625.00

The cost of buying additional empty *cans* at both the levels is lower than the cost of their manufacture.

(a) If the company increases production to 1,75,000 *cans* of 'EXE', 1,50,000 empty *cans* should be manufactured and additional 25,000 *cans* should be purchased at ₹16,875 [Refer W.N. 5&6]

If the company increases production to 2,25,000 *cans* of 'EXE', 1,50,000 empty *cans* should be manufactured and additional 75,000 *cans* should be purchased at a cost of ₹ 50,625. [Refer W.N. 5&6]

(b) Additional fixed overheads to be incurred on a new machine: ₹7,500 Savings per unit if empty *cans* are made instead of buying:

₹ 0.675 – ₹ 0.6375 = ₹ 0.0375

Minimum additional quantity of empty *cans* to be made to recover the additional fixed costs:

₹7,500/ ₹0.0375 = 2,00,000 empty *cans*

Installation of the new machine for the manufacture of empty *cans* will be economical at production level of 3,50,000 *cans* per month .

(c) Evaluation of the profitability on sale of "EXE" at the three levels.

	Per *can* (₹)	1,50,000 *can* (₹)	1,75,000 *can* (₹)	2,25,000 *can* (₹)
Sales	5.0000	7,50,000.00	8,75,000.00	11,25,000.00
Less: Direct Material	1.8000	2,70,000.00	3,15,000.00	4,05,000.00
Direct Wages	1.3500	2,02,500.00	2,36,250.00	3,03,750.00
Variable Overheads	0.3375	50,625.00	59,062.50	75,937.50
Empty *can* made	0.6375	95,625.00	95,625.00	95,625.00
Empty *can* purchases	0.6750		16,875.00	50,625.00
Net Gain		1,31,250.00	1,52,187.50	1,94,062.50

5. The objective of the given problem is to identify the preferences of marriage parties about halls so that hotel management could maximize its profit.

To solve this problem first convert it to a minimization problem by subtracting all the elements of the given matrix from its highest element. The matrix so obtained which is known as loss matrix is given below-

Loss Matrix/Hall

Marriage Party	1	2	3	4
A	0	2,500	X	X
B	5,000	0	5,000	12,500
C	7,500	0	10,000	5,000
D	0	5,000	X	X

Now we can apply the assignment algorithm to find optimal solution. Subtracting the minimum element of each column from all elements of that column-

Loss Matrix/Hall

Marriage Party	1	2	3	4
A	0	2,500	X	X
B	5,000	0	0	7,500
C	7,500	0	5,000	0
D	0	5,000	X	X

The minimum number of lines to cover all zeros is 3 which is less than the order of the square matrix (i.e.4), the above matrix will not give the optimal solution. Subtracting the

minimum uncovered element (2,500) from all uncovered elements and add it to the elements lying on the intersection of two lines, we get the following matrix-

Loss Matrix/Hall

Marriage Party	1	2	3	4
A	0	0	X	X
B	7,500	0	0	7,500
C	10,000	0	5,000	0
D	0	2,500	X	X

Since the minimum number of lines to cover all zeros is 4 which is equal to the order of the matrix, the above matrix will give the optimal solution which is given below-

Loss Matrix/Hall

Marriage Party	1	2	3	4
A	0	0	X	X
B	7,500	0	0	7,500
C	10,000	0	5,000	0
D	0	2,500	X	X

Optimal Schedule is-

Marriage Party	Hall	Revenue (₹)
A	2	22,500
B	3	20,000
C	4	20,000
D	1	25,000
Total		87,500

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

Manager	Assignment			Time Available (Hours)
	Transfer Pricing (₹)	Corporate Valuation (₹)	Statutory Audit (₹)	
Peter	1,800	2,250	2,850	176
Johns	2,100	1,950	1,800	176
Albert	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)
	Transfer Pricing (₹)	Corporate Valuation (₹)	Statutory Audit (₹)	Dummy (₹)	
Peter	1,800	2,250	2,850	0	176
Johns	2,100	1,950	1,800	0	176
Albert	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)
	Transfer Pricing (₹)	Corporate Valuation (₹)	Statutory Audit (₹)	Dummy (₹)	
Peter	1,050	600	0	2,850	176
Johns	750	900	1,050	2,850	176
Albert	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 Available (Hours)	
	Transfer Pricing (₹)	Corporate Valuation (₹)	Statutory Audit (₹)	Dummy (₹)		
Peter	1,050	600	0 176	2,850	176/0	600 - -
Johns	750	900 121	1,050	2,850 55	176/55/0	150 150 1,950
Albert	450 143	750 33	600	2,850	176/33/0	150 300 2,100
Time Required (Hours)	143/0	154/121/0	176/0	55/0	528	
	300	150	600	0		
	300	150	--	0		
	-	150	-	0		

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

Manager	Assignment			
	Transfer Pricing (₹)	Corporate Valuation (₹)	Statutory Audit (₹)	Dummy (₹)
Peter	1,050	600	0 176	2,850
Johns	750	900 121	1,050	2,850 55
Albert	450 143	750 33	600 e	2,850

Let us test the above solution for optimality-

(u_i+v_j) matrix for allocated cells

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

(u_i+v_j) matrix for un allocated cells

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

$\Delta_{ij} = C_{ij} - (u_i+v_j)$

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
Peter	Statutory Audit	₹5,01,600 (176 hrs. x ₹2,850)
Johns	Corporate Valuation	₹2,35,950 (121 hrs. x ₹1,950)
Albert	Transfer Pricing	₹3,43,200 (143 hrs. x ₹2,400)
Albert	Corporate Valuation	₹69,300 (33 hrs. x ₹2,100)
Total Billing		₹11,50,050

7. 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.

8. (i) Calculation of total labour hours over the life time of the product 'Kitchen Care'

The average time per unit for 250 units is

$Y_x = ax^b$

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 is

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

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

(ii) Profitability of the product 'Kitchen Care'

Sales 1,000 Units

Particulars	Amount (₹)	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	31,66,260
Contribution		18,33,740
Packing Machine Cost		5,00,000
Profit		13,33,740

(iii) 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

9. Customer Profitability Statement

Particulars		MT Ltd.	KG Ltd.	MG Bros.
Sales (units)		2,000	1,000	800
		(₹)	(₹)	(₹)
Sales Revenue	(A)	2,20,00,000	1,10,00,000	88,00,000
Less: Average Variable Cost (₹ 5,500 × 60% = 3,300 p.u.)	(B)	66,00,000	33,00,000	26,40,000
Contribution [70%of Sales]	(A)-(B)	1,54,00,000	77,00,000	61,60,000
Less: Additional Overheads				
Delivery Cost (No. of K.M. × ₹ 200)		2,00,000	1,60,000	1,80,000
Emergency Delivery Cost (No. of Emergency Delivery × ₹ 21,000)		42,000	21,000	-
Order Processing Cost (No. of Orders × ₹ 6,000)		24,000	12,000	48,000
Specific Discount		55,00,000	22,00,000	13,20,000
Sales Commission		33,00,000	11,00,000	4,40,000
Advertisement Cost		8,75,000	6,15,000	4,30,000
Profit *per customer**		54,59,000	35,92,000	37,42,000
Profit Margin *per customer** (%)		24.81%	32.65%	42.52%
Rank		III	II	I

* Before deducting general fixed overhead cost

The contribution margin is 70% for each customer but when the other overheads costs per customer is included in the above profitability statement the profitability of the three customers become different. MG Bros. is the most profitable customer.

10. (i) Transfer price per unit of product Z that Division A should quote in order to meet target profit for the year:

Quotation for the 40,000 units of product Z should be such that meet Division A'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 from external sales {60,000 units × ₹(2,500 – 1,600)}	5,40,00,000
Contribution required from 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.

11. Traditional Variance (Actual Vs Original Budget)

Usage Variance = (Standard Quantity – Actual Quantity) x Standard Price

= (2,500 Kg – 2,700 Kg) x ₹1.50

= ₹ 300 (A)

Price Variance = (Standard Price – Actual Price) x Actual Quantity

= (₹1.50 – ₹2.40) x 2,700 Kg

= ₹2,430 (A)

Total Variance = ₹300 (A) + ₹2,430 (A) = ₹2,730 (A)

Operational Variance (Actual Vs Revised)

Usage Variance = (2,500 Kg – 2,700 Kg) x ₹2.25
= ₹450 (A)

Price Variance = (₹2.25 – ₹2.40) x 2,700 Kg
= ₹405 (A)

Total Variance = ₹450 (A) + ₹405 (A) = ₹855 (A)

Planning Variance (Revised Vs Original Budget)

Controllable Variance = (₹2.00 – ₹2.25) x 2,500 Kg
= 625 (A)

Uncontrollable Variance = (₹1.50 – ₹2.00) x 2,500 Kg
= 1,250 (A)

Total Variance = ₹625 (A) + ₹1,250 (A) = ₹1,875 (A)

Traditional Variance = Operational Variance + Planning Variance
= 855 (A) + 1,875 (A) = 2,730 (A)

☞ A **Planning Variance** simply compares a revised standard to the original standard. An **Operational Variance** simply compares the actual results against the revised amount. **Controllable Variances** are those variances which arises due to inefficiency of a cost centre /department. **Uncontrollable Variances** are those variances which arises due to factors beyond the control of the management or concerned department of the organization.

12. Statement Showing Standard Cost and Actual Cost of 320th Batch:

Standard Data			Actual Data			
Material						
SQ	SP	SQ x SP	AQ	AP	AQ x AP	SP x AQ
62.07 Kgs. (Refer W.N.1)	₹55	₹3,414	80 Kgs.	₹ 50.00	₹ 4,000.00	₹ 4,400.00
Labour						
SH	SR	SH x SR	AH	AR	AH x AR	SR x AH
12.42 hours (Refer W.N.2)	₹ 40	₹ 497	20 hours	₹ 50.00	₹ 1,000.00	₹ 800
Variable Overhead						
SH	SR	SH x SR	AH	AR	AH x AR	SR x AH
12.42 hours (Refer W.N.2)	₹75	₹932	20 hours	₹90.00	₹1,800.00	₹1,500

Computation of Variances:

Material Cost Variance = Standard Material Cost – Actual Material Cost

= SQ × SP – AQ × AP

= ₹ 3,414 – ₹4,000 = ₹586 (A)

Material Usage Variance = Standard Cost of Standard Quantity – Standard Cost of Actual Quantity

= SQ × SP – AQ × SP

= ₹ 3,414 – ₹4,400 = ₹ 986 (A)

Material Price Variance = Standard Cost of Actual Quantity – Actual Material Cost

= AQ × SP – AQ × AP

= ₹ 4,400 – ₹4,000 = ₹ 400 (F)

Labour Cost Variance = Standard Cost of Labour – Actual Cost of Labour

= SH × SR – AH × AR

= ₹497 – ₹1,000 = ₹503 (A)

Labour Efficiency Variance = Standard Cost of Standard Time – Standard Cost for Actual Time

= SH × SR – AH × SR

= ₹497 – ₹800 = ₹303 (A)

Labour Rate Variance = Standard Cost for Actual Time – Actual Cost of Labour

= AH × SR – AH × AR

= ₹ 800 – ₹1,000 = ₹ 200 (A)

Variable Overhead Cost Variance

= Standard Variable Overheads for Production – Actual Variable Overheads

= ₹932 – ₹1,800 = ₹ 868 (A)

Variable Overhead Efficiency Variance

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

= ₹932 – 20 Hours x ₹75

= ₹568 (A)

Variable Overhead Expenditure Variance

= Budgeted Variable Overheads for Actual Hours – Actual Variable Overheads

= 20 Hours x ₹75 – ₹1,800

= ₹ 300 (A)

Working Note:

(1) Working note showing Standard Quantity of Material for 320th Batch.

Cumulative Number of Batches =320

Average Kgs. of Material *per batch*= $100x320^{-0.074}$

$t = 100x320^{-0.074}$

log t = log100 – 0.074 × log320

log t = log100 – 0.074 x log (2x2x2x2 x2x2x5)

log t = log100 – 0.074 x [$log2^6$ + log 5]

log t = log100 – 0.074 x [6log2 + log 5]

log t = 2 – 0.074 x [6 x 0.30103 + 0.69897]

log t = 1.81462

t = Antilog (1.81462)

t = 65.26

Cumulative Number of Batches =319

Average Kgs. of Material *per batch*= $100x319^{-0.074}$

$t = 100x319^{-0.074}$

log t = log100 – 0.074 × log319

log t = log100 – 0.074 x log319

log t = 2 – 0.074 x 2.50379

log t = 1.81472

t = Antilog (1.81472)

t = 65.27

Standard Quantity of Material for 320th Batch = 320 x 65.26 – 319 x 65.27 = 62.07 Kgs.

(2) Working note showing Standard Hours for 320th Batch.

Cumulative Number of Batches =320

Average Labour Hours *per batch* = $100x320^{-0.322}$

$t = 100x320^{-0.322}$

log t = log100 – 0.322 x log320

log t = log100 – 0.322 x log (2x2x2x2x2 x2x5)

log t = log100 – 0.322 x [$\log 2^6$ + log 5]

log t = log100 – 0.322 x [6log2 + log 5]

log t = 2 – 0.322 x [6 x 0.30103 + 0.69897]

log t = 1.19334

t = Antilog (1.19334)

t = 15.61

Cumulative Number of Batches =319

Average Labour Hours *per batch* = $100x319^{-0.322}$

$t = 100x319^{-0.322}$

log t = log 100 – 0.322 x log319

log t = 2 – 0.322 x 2.50379

log t = 1.19378

t = Antilog (1.19378)

t = 15.62

Standard Hours for 320th Batch = 320 x 15.61 – 319 x 15.62 = 12.42 hours

13. (a) 1. Projected Raw Material Issues (Kg):

	'A'	'B'	'C'
'X' (48,000 units-Refer Note)	60,000	24,000	---
'Y' (36,000 units-Refer Note)	72,000	-	54,000
Projected Raw Material Issues	1,32,000	24,000	54,000

Note:

- Based on this experience and the projected sales, the BIML has budgeted production of 48,000 units of 'X' and 36,000 units of 'Y' in the sixth period.

=52,500 x 40% + 45,000 – 18,000 = 48,000

=27,000 x 40% + 42,000 – 16,800 = 36,000

- Production is assumed to be uniform for both products within each four-week period.

2 and 3. Projected Inventory Activity and Ending Balance (Kg):

	'A'	'B'	'C'
Average Daily Usage	6,600	1,200	2,700
Beginning Inventory	96,000	54,000	84,000
Orders received:			
Ordered in 5th period	90,000	-	60,000
Ordered in 6th period	90,000	-	-
Sub Total	276,000	54,000	144,000
Issues	132,000	24,000	54,000
Projected ending inventory balance	144,000	30,000	90,000

Note:

- Ordered 90,000 Kg of 'A' on fourth working day.
- Order for 90,000 Kg of 'A' ordered during fifth period received on tenth working day.
- Order for 90,000 Kg of 'A' ordered on fourth working day of sixth period received on fourteenth working day.
- Ordered 30,000 Kg of 'B' on eighth working day.
- Order for 60,000 Kg of 'C' ordered during fifth period received on fourth working day.
- No orders for 'C' would be placed during the sixth period.

4. Projected Payments for Raw Material Purchases:

Raw Material	Day/Period Ordered	Day/Period Received	Quantity Ordered	Amount Due	Day/Period Due
'A'	20th/5th	10th /6th	90,000 Kg	₹ 90,000	20th/6th
'C'	4th/5th	4th /6th	60,000 Kg	₹ 60,000	14th/6th
'A'	4th/6th	14th /6th	90,000 Kg	₹ 90,000	4th/7th
'B'	8th/6th	13th /7th	30,000 Kg	₹ 60,000	3rd /8th

14. Refer Time Scale Diagram-1:

This is a problem of duration constraint of 100 days as also resource constraint (audit executives).

We have to re-arrange the activities so that they can be performed with the given resource availabilities in the stipulated time of 100 days.

Refer Time Scale Diagram-2:

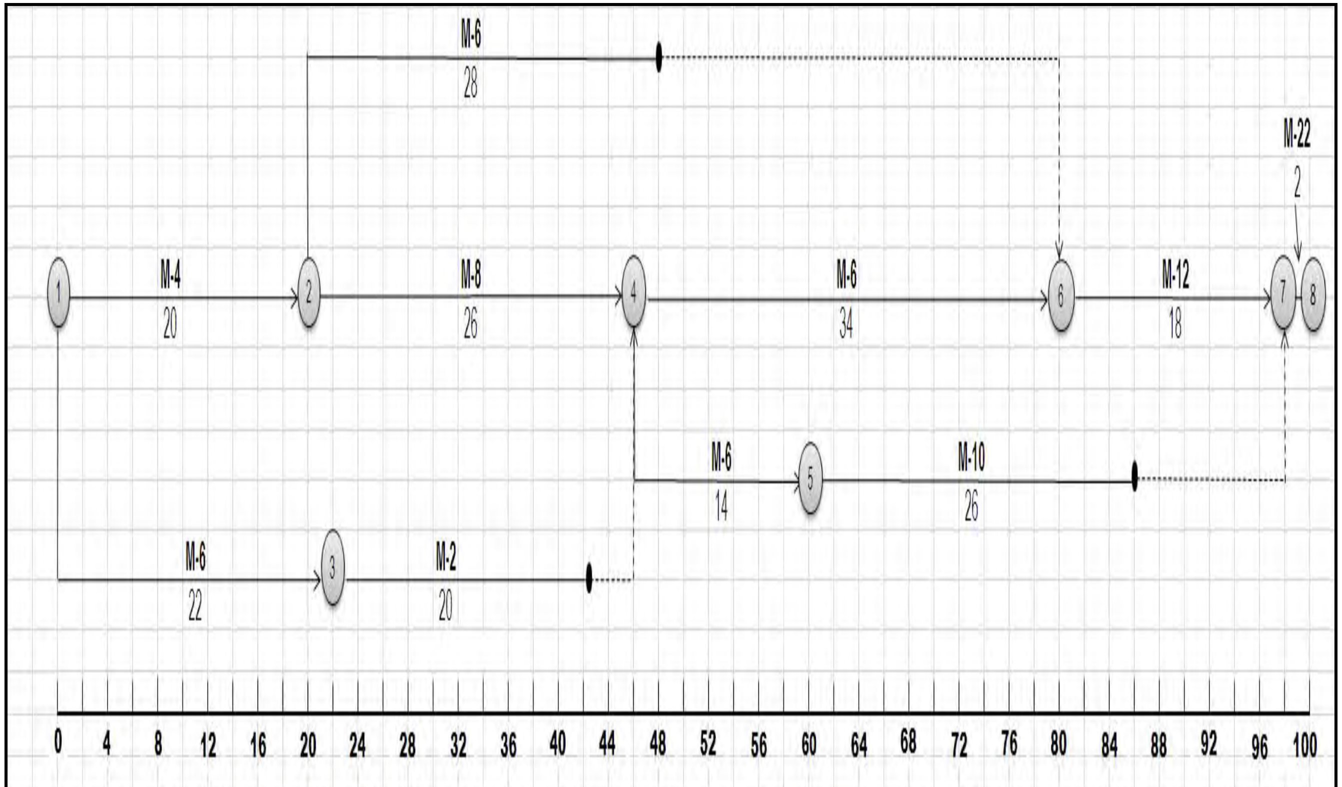
The critical activities 1-2, 2-4, 4-6, 6-7, and 7-8 would be scheduled first. Activity 1-3 is not critical. However scheduling 1-3 even at the scheduled time zero would involve increase of audit executives to 14 on days 21 & 22, which is in excess of availability. We therefore have to resort to do this by doing overtime.

Now activities 2-6 can be delayed by 32 days i.e. instead of starting it on 21st day we can delay it to start on 53rd day.

Similarly we delay activities 4-5 and 5-7 by twelve days each to start on 59th day and 73rd day.

This would ensure that the resources are demanded as per availability and project completion too take place at 100 days.

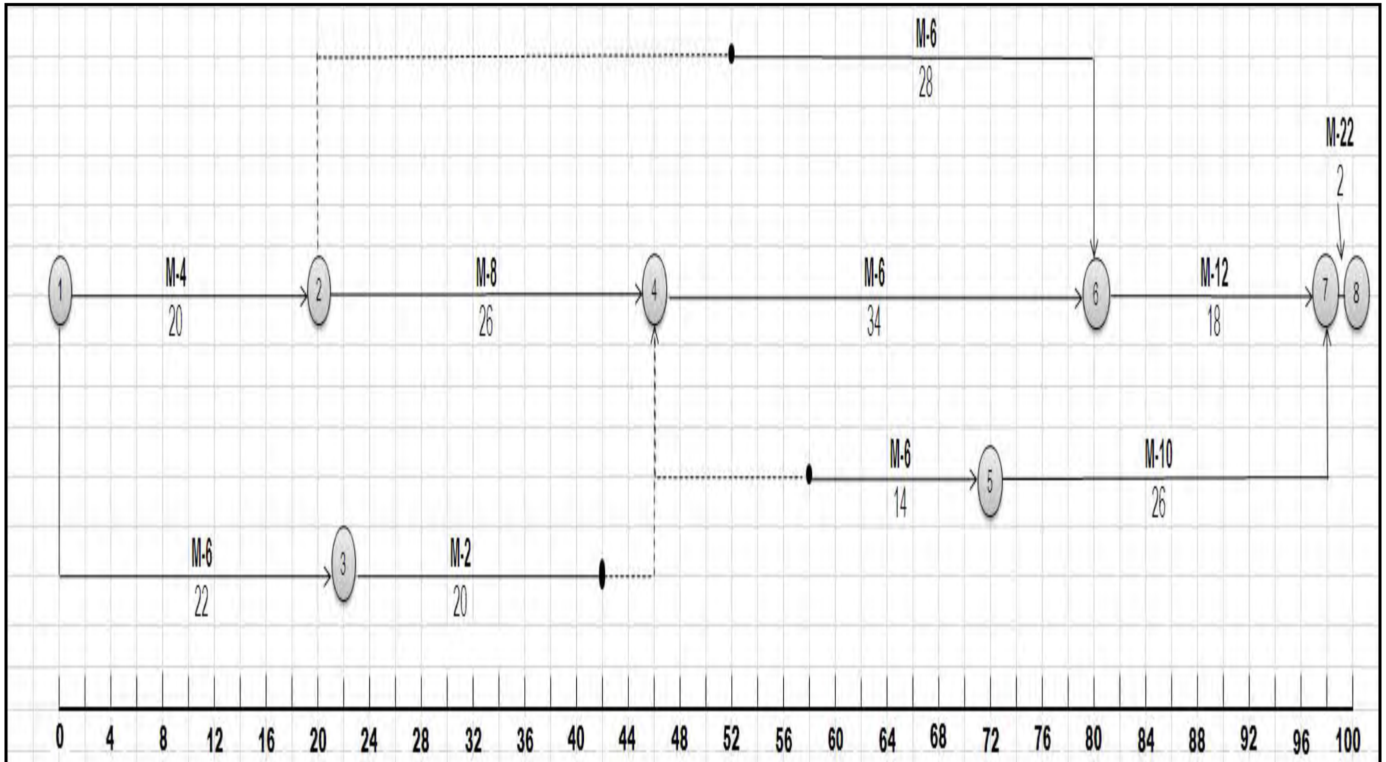
Time Scale Diagram-1



Demand	10	10	10	10	10	10	10	10	10	10	20	16	16	16	16	16	16	16	16	16	16	14	14	18	12
Supply	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Shortage	0	0	0	0	0	0	0	0	0	0	-10	-6	-6	-6	-6	-6	-6	-6	-6	-6	-6	-4	-4	-8	-2

Demand	12	12	12	12	12	16	16	16	16	16	16	16	16	16	16	22	22	22	12	12	12	12	12	12	22
Supply	10	10	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Shortage	-2	10	10	10	10	6	6	6	6	6	6	6	6	6	6	0	0	0	10	10	10	10	10	10	0

Time Scale Diagram-2



Demand	10	10	10	10	10	10	10	10	10	10	14	10	10	10	10	10	10	10	10	10	10	8	8	6	6
Supply	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
Shortage	0	0	0	0	0	0	0	0	0	0	-4	0	0	0	0	0	0	0	0	0	0	2	2	4	4

Demand	6	12	12	12	18	18	18	18	18	18	18	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Supply	10	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22
Shortage	4	10	10	10	4	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0

15. The following is a possible scorecard for "Hard Rock Coconut"

Financial Perspective	Economic Value Added Revenue per villa
Customer Perspective	% repeat customers Number of customer complaints
Internal Business	Service rating of spa Staff hours per guest % cost spent for maintenance Travel guide rank for restaurant
Innovation and Learning	Employee retention Number of new services offered

16. To overcome the ***optimum decision making*** and ***performance evaluation conflicts*** that can occur with ***marginal cost-based transfer pricing*** following methods has been proposed:

Dual Rate Transfer Pricing System

"With a 'Dual Rate Transfer Pricing System' the 'Receiving Division' is charged with marginal cost of the intermediate product and 'Supplying Division' is credited with full cost per unit plus a profit margin".

Accordingly Division 'Dx' should be allowed to record the transactions at *full cost per unit* plus *a profit margin*. On the other hand Division 'Dz' may be charged only *marginal cost*. Any inter divisional profits can be eliminated by accounting adjustment.

Impact:

- Division 'Dx' will earn a profit on inter Division transfers.
- Division 'Dz' can chose the output level at which the marginal cost of the product 'X' is equal to the net marginal revenue of the product 'Z'.

Two Part Transfer Pricing System:

"The 'Two Part Transfer Pricing System' involves transfers being made at the marginal cost per unit of output of the supplying Division plus a lump-sum fixed fee charged by the supplying Division to the receiving Division for the use of the capacity allocated to the intermediate product."

Accordingly Division 'Dx' can transfer its products to Division 'Dz' at *marginal cost per unit* and *a lump-sum fixed fee*.

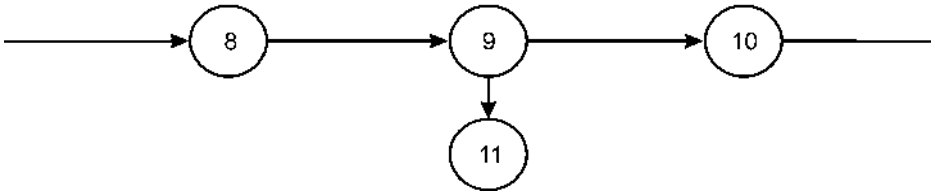
Impact:

- 'Two Part Transfer Pricing System' will inspire the Division 'Dz' to choose the optimal output level.
- This pricing system also enable the Division 'Dx' to obtain a profit on inter Division transfer.

17. Generally three types of errors in logical sequencing may arise while drawing a network diagram, particularly when it is a complicated one. These are known as *looping, dangling and redundancy.*

(1) Looping: Normally in a network, the arrow points are from left to right. This convention is to be strictly adhered, as this would avoid illogical looping. Looping error is also known as Cycling error.

(2) Dangling: Activity which is not connected to any of the intermediate events or end event is called dangling activity. The situation represented by the following diagram is also at fault, since the activity represented by the dangling arrow 9-11 is undertaken with no result.

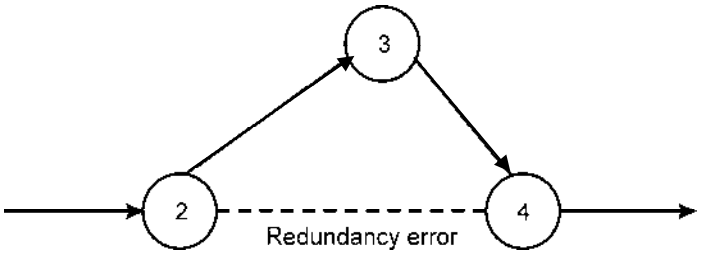


To overcome the problem arising due to dangling arrows, following rules may be adopted.

(i) All events, except the first and the last, must have at least one activity entering and one activity leaving them, and

(ii) All activities must start and finish with an event.

(3) Redundancy: When dummy activities are inserted in a network diagram unnecessarily, this type of error is called error of redundancy. It is shown in the following figure:



18. Target costing is most useful in situations where the majority of product costs are locked in during the product design phase. This is the case for most manufactured products, but only for few services. In the services area, such as consulting, the bulk of all activities can be reconfigured for cost reduction during the "production" phase, which is when services are being provided directly to the customer. In the services environment the "design team" is still present but is more commonly concerned with streamlining the activities conducted by the employees providing the service, which can continue to be enhanced at any time, not just when the initial services process is being laid out. For example, Design team can lay out the floor plan of a fast-food restaurant, with the objective of creating an arrangement that allows employees to cover the shortest possible distances while preparing food and serving customers; this is similar to the design of a new product. However, unlike a product design, this layout can be readily altered at any time if the design team can arrive at a better layout, so that the restaurant staff can continue to experience high levels of productivity improvement even after the initial design and layout of the facility. In this situation costs are not locked in during the design phase, so there is less need for target costing.

19. While preparing to enter the market with a new product, X Ltd. has to adopt a skimming or penetration pricing strategy.

    Skimming Pricing*:* It is a policy of high prices during the early period of a product's existence. This can be synchronised with high promotional expenditure and in the later years the prices can be gradually reduced.

    Penetration Pricing: Penetrating pricing, means a pricing suitable for penetrating mass market as quickly as possible through lower price offers. The company may not earn profit by resorting to this policy during the initial stage. Later on, the price may be increased as and when the demand picks up.

    X Ltd. should follow 'Penetration Pricing' as -

    (a) Demand of product 'Gamma' can be increase by lowering the price as it has elastic demand.

    (b) There is also scope of substantial savings on large scale production and increase in demand is sustained by the adoption of low pricing policy.

    (c) The prices fixed at a low level act as an entry barrier to the prospective competitors.

20. (a) Inter-Firm Comparison: It is technique of evaluating the performance, efficiency, costs and profits of firms in an industry. It consists of voluntary exchange of information/data concerning costs, prices, profits, productivity and overall efficiency among firms engaged in similar type of operations for the purpose of bringing improvement in efficiency and indicating the weaknesses. Such a comparison will be possible where uniform costing is in operation.

(b) Simulation: Simulation is a quantitative procedure which describes a process by developing a model of that process and then conducting a series of organized trial and error experiments to product the behavior of the process over time.

(c) Standard, ex post: *After the event*. An ex post budget, or standard, is set after the end of a period of activity, when it can represent the optimum achievable level of performance in the conditions which were experienced. Thus the budget can be flexed, and standards can reflect factors such as unanticipated changes in technology and in price levels. This approach may be used in conjunction with sophisticated cost and revenue modelling to determine how far both the plan and the achieved results differed from the performance that would have been expected in the circumstances which were experienced.

Standard, ex ante: *Before the event*. An ex ante budget or standard is set before a period of activity commences

(d) Six Sigma: Continuous improvement can be brought into the organisational culture by introducing continuously changing planned targets. One such target can be six-sigma accuracy. The sigma accuracy means the process is 99.999998% accurate. That is the process will/can produce only 0.002 defects per million. This is the structural meaning of six-sigma. In quality practice, six-sigma means 3.4 parts per million.

Six sigma is the statistical measure used to ensure quality of products and services. The six sigma academy has developed a break through strategy consisting of measure, analyze, improve and control, that allows companies to make exceptional bottom-line improvements.

In addition to the material and labour savings, which flow directly to the bottom line, a company engaged in six sigma can expect to see:

- Improved customer satisfaction
- Reduction cycle time
- Increased productivity
- Reduction in total defect
- Improved process flow

Six sigma Capability Chart

Sigma	Parts per million
Six sigma	3.4 defects per million
Five sigma	233 defects per million
Four sigma	6,120 defects per million
Three sigma	66,807 defects per million
Two sigma	3,08,537 defects per million
One sigma	6,90,000 defects per million

(e) Just-in-Time Production: Production system which is driven by demand for finished products, whereby each component on a production line is produced only when needed for the next stage.

Just-in-time purchasing: Purchasing system in which material purchases are contracted so that the receipt and usage of material, to the maximum extent possible, coincide.