

PAPER – 5 : ADVANCED MANAGEMENT ACCOUNTING

QUESTIONS

Total Quality Management – Non Conformance Cost

1. 7 Star Sports Co. (7SSC) is engaged in the manufacture of cricket bats. Following table shows the budgeted figures for the coming year:

Particulars	₹ per unit
Selling Price	4,800
Less: Components (1 Set)	1,200
Assembling Costs	2,000
Delivery Cost	800
Contribution	800

Components like willow, rubber grip and handle bar in a set, are bought in and an assembling process carried out to transform them into a single bat. Market is intensely competitive where 7SSC currently holds 30% market share. Annual demand of these bats is 1,00,000 units.

On reviewing previous performance it is revealed that 3% of the bats supplied to customers were returned for free replacement because of faults. Defective components, which are initially bought in to assembling process, are held responsible for this. These returned bats cannot be repaired and have no scrap value. Supply of faulty bats to customers could be eliminated by implementing an inspection process immediately before the goods are delivered. This would improve customer perception thus resulting in an increase of 5% in current market share (making in all a total share of 35%).

- (i) Calculate the quality non-conformance cost for the coming year, based on the budgeted figures and sales returns rate.
- (ii) Calculate the impact on profitability due to implementation of inspection process for the bats.

Life Cycle Costing and Pricing Strategy

2. P & G International Ltd. (PGIL) has developed a new product 'α³' which is about to be launched into the market. Company has spent ₹ 30,00,000 on R&D of product 'α³'. It has also bought a machine to produce the product 'α³' 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 <i>per week (units)</i>
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

PGIL uses just-in-time production system. Following is the total contribution statement of the product 'α³' for its Introduction and Growth phase:

Weeks	Introduction	Growth	
	1 - 10	11 - 30	
Number of units Produced and Sold	2,200	5,500	8,250
Selling Price <i>per unit</i> (₹)	750	600	525
Variable Cost <i>per unit</i> (₹)	375	300	300
Contribution <i>per unit</i> (₹)	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 'α³'.
- (iii) Find possible reasons for the changes in cost during the life cycle of the product 'α³'.

Note: Ignore the time value of money.

Value Chain Analysis – Primary Activity

3. ABC Ltd. is engaged in business of manufacturing branded readymade garments. It has a single manufacturing facility at Ludhiana. 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.
State the primary activities as per Porter's Value Chain Analysis in the value chain of ABC Ltd with brief description.

Just in Time

4. KP Ltd. (KPL) manufactures and sells one product called "KEIA". 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 "KEIA". As per the opinion of managing director of KPL 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"*.

KPL 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, KPL has to pay overtime rate which is 45% premium to the normal hourly rate of ₹110 per hour. For avoiding this overtime payment, KPL 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. KPL has determined that the cost of holding inventory is ₹70 per month for each standard hour of output that is held in inventory.

KPL has forecast the demand for its products for the first six months of year 2014 as follows:

Month	Demand (Standard Hrs)
Jan'14	3,150
Feb'14	3,760
Mar'14	4,060
Apr'14	3,350
May'14	3,650
Jun'14	4,830

Following other information is given:

- All other production costs are either fixed or are not driven by labour hours worked.
- Production and sales occur evenly during each month and at present there is no stock at the end of Dec'13.
- The labour are to be paid for their minimum contracted hours in each month irrespective of any purchase and production system.

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

Break-even Point – Production in Batches

- Electro Life 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	<u>1,00,000</u>	14,00,000
General fixed overheads		<u>6,20,000</u>
		<u>31,00,000</u>

The other information is as follows:-

	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

- (i) You are required to prepare a profitability statement that is more useful for decision making than the profit statement prepared by Electro Life Ltd.
- (ii) Calculate the break even volume in batches and also in approximate units for Product 'Alpha'.

Decision Making (Service Sector) - Quantitative Vs Qualitative Factors

6. Recently, Ministry of Health and Family Welfare along with Drug Control Department have come hard on health care centres for charging exorbitant fees from their patients. Human Health Care Ltd. (HHCL), a leading integrated healthcare delivery provider company is feeling pinch of measures taken by authorities and facing margin pressures due to this. HHCL is operating in a competitive environment so; it's difficult to increase patient numbers also. Management Consultant of the company has come out with some plan for cost control and reduction.

HHCL provides treatment under package system where fees is charged irrespective of days a patient stays in the hospital. Consultant has estimated 2.50 patient days per patient. He wants to reduce it to 2 days. By doing this, consultant has targeted the

general variable cost of ₹ 500 per patient day. Annually 15,000 patients visit to the hospital for treatment.

Medical Superintendent has some concerns with that of Consultant's plan. According to him, reducing the patient stay would be detrimental to the full recovery of patient. They would come again for admission thereby increasing current readmission rate from 3% to 5%; it means readmitting 300 additional patients per year. Company has to spend ₹ 25,00,000 more to accommodate this increase in readmission. But Consultant has found blessing in disguise in this. He said every readmission is treated as new admission so it would result in additional cash flow of ₹ 4,500 per patient in the form of admission fees.

Calculate the impact of Management Consultant's plan on profit of the company. Also comment on result and other factors that should be kept in mind before taking any decision.

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 – Preparation and Monitoring Procedures

8. "Because a single budget system is normally used to serve several purposes, there is a danger that they may conflict with each other".

Do you agree? Discuss.

Standard Costing – Basic Concepts

9. KYC Ltd. uses a standard absorption costing system. The following details have been extracted from its budget for year 2013-14.

Fixed Overhead Cost	₹ 7,20,000
Production	36,000 units

In 2013-14 the Fixed Overhead Cost was over-absorbed by ₹3,200 and the Fixed Overhead Expenditure Variance was ₹20,000(F). What was the actual number of units produced in 2013-14?

Standard Costing – Reconciliation of Budgeted and Actual Profit

10. Osaka Manufacturing Co. (OMC) is a leading consumer goods company. The budgeted and actual data of OMC for the year 2013-14 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. Prepare a statement showing reconciliation of budget profit to actual profit through marginal costing approach for the year 2013-14 in as much detail as possible.

Multinational Transfer Pricing

11. Celestial Electronics and Consumer Durables Corporation (CECDC), is a Taiwan (a state, Republic of China) based consumer electronics manufacturer. To expand its market share in South Asia it has formed CE CDC India Pvt. Ltd. (CIPL) in India. For the purpose of performance evaluation, the Indian part is treated as responsibility centre. CIPL imports components from the CE CDC and assembles these components into a LED TV to make it saleable in the Indian market. To manufacture an LED TV two units of component 'L_x' are required. The following cost is incurred by the CE CDC to manufacture a unit of component 'L_x':

	Amount (TWD)
Direct Material*	440.00
Direct Labour (3 hours)	120.00
Variable Overheads	40.00

(*) purchased from domestic market.

CECDC incurs TWD 30 per unit as Wharfage Charges.

CECDC has a normal manufacturing capacity of 5,00,000 units of component 'L_x' per annum, 70% of its production is exported to CIPL and rest are sold to other South-east Asian countries at TWD 750 per component. The tax authorities both in Taiwan and India, consider TWD 750 (= ₹1,500) per component 'L_x' as arm's length price for all transfers to CIPL. CIPL incurs ₹10 per unit as shipment charges.

The cost data relevant to the LED TVs are as follows:

	Amount (₹)
Variable Costs <i>per unit</i> :	
Direct Material (excluding component 'L _x ')	6,200
Direct Labour	115
Fixed Cost:	
Office and Administrative Overheads	1,18,00,000
Selling & Distribution Overheads	2,58,00,000

CIPL can sell 1,75,000 units of LED TV at ₹11,000 per unit.

There is a dispute on the transfer pricing of component 'L_x' between the CECDC and CIPL. CECDC is in favour of charging TWD 750 per component to CIPL as it is the arm's length price and it has to pay tax on this. On the other hand CIPL in its argument saying that the substitute of component 'L_x' can be purchased from the Indian market at ₹1,490 only and moreover it has to pay import duty on import of component 'L_x' so the transfer price suggested by CECDC is not acceptable.

The following are the direct / indirect tax structure in India and Taiwan:

Type of Tax / Duty	India	Taiwan
Corporate Tax Rate	30%	25%
Import (Custom) Duty	10%	15%
Export Duty	Nil	Nil

From the above information, Calculate:

- (i) Minimum Price at which CECDC can transfer component 'L_x' to CIPL.
- (ii) Maximum Price that can be paid by CIPL to CECDC for each component 'L_x'.
- (iii) Profitability Statement for the group in TWD.

Note:

- (i) For Duty and Tax calculation, consider *arm's length price* only.
- (ii) Ignore the DTAA and other tax provisions.
- (iii) Conversion Rate 1 INR = 0.50 TWD

Transportation Problem - Degeneracy

12. 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
B	142.50	105.00	157.50	137.50
C	122.50	130.00	120.00	160.00
D	102.50	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

13. 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

14. 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

15. 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

16. City 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]

Cost Classification

17. Identify the type of cost along with the reasons.
- An advertising program has been set and management has signed the non negotiable contract for a year with an agency. Under the terms of contract, agency will create 5 advertisements within the contract duration for the company and company will pay ₹12,00,000 for each advertisement.
 - A manager has to decide to run a fully automated operation that produces 100,000 widgets per year at a cost of ₹1,200,000, or of using direct labour to manually produce the same number of widgets for ₹1,400,000.
 - A Company had paid ₹5,00,000 a Marketing Research company to find expected demand of the newly developed product of the company.
 - A company has invested ₹25 lacs in a project. Company could have earned ₹2 lacs by investing the amount in Government securities.

- (v) A Oil Refining Co. has paid a salary of ₹20,00,000 to the chairman for a particular year. The Company has sold 25 MT of Oil in that particular year.
- (vi) Accountant of a cloth factory paid ₹25,000 for water that has been used for washing clothes before they go for final drying process.

Miscellaneous

18. Write a short note on-
- Predatory Pricing
 - Shadow Price
 - Inter-firm Comparison
 - Redundancy Error

SUGGESTED ANSWERS/ HINTS


1. (i) Calculation of Quality Non- Conformance Cost

Annual Sales	=	1,00,000 × 30%	
	=	30,000 units	
Number of returned bats which are replaced <i>free of cost</i> =		30,000units × $\frac{3}{97}$	
	=	928 units	
Cost of 928 units that are replaced <i>free of charge</i>	=	928 × ₹4,000	
	=	₹37,12,000	(A)
Contribution Lost (Market Share) due to <i>faulty bats</i>	=	₹35,04,000	(B)
So, Total Quality Non-Conformance Cost [(A) + (B)]	=	₹72,16,000	

Statement Showing Contribution Lost (Market Share) due to *faulty bats*

Particulars	₹ '000
Sales (5,000 units × ₹4,800)	24,000
Less: Variable Cost [(₹1,200 units + ₹2,000 + ₹800) × 5,000 units]	20,000
Less: Relevant Cost of <i>faulty bats</i> [155units × (₹2,000 + ₹1,200)]	496
Contribution	3,504

$$\text{No. of Faulty Bats} = 155 \left(5,000 \text{units} \times \frac{3\%}{97\%} \right)$$

 **Quality Non-Conformance Costs** are costs that are incurred by a firm as an outcome of quality failures that have occurred.

(ii) Impact on Profitability due to *implementation of inspection process*

Implementing *inspection process* before delivery to the customer would eliminate risk of supplying faulty bat to the customer. This would lead to improvement in customer perception, thus increasing market share to 35%.

Additional Contribution due to *increase in market share* = ₹35,04,000 (C)

Saving in the Delivery Cost on 928 faulty bats = 928 units × ₹800
= ₹ 7,42,400 (D)

Total Increase in Profit [(C) + (D)] = ₹ 42,46,400

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 α^3

PGIL is following the skimming price strategy that's why it has planned to launch the product α^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, PGIL 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 α^3 is decreasing gradually stage by stage. This is happening because PGIL 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 ' α^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:

PGIL is expecting reduction in unit cost of the product α^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, PGIL is in the expansion mode. The PGIL may be able to take advantages of quantity discount offered by suppliers or may negotiate the price with suppliers.

Product α^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 α^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 PGIL 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 ABC 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*

$$\begin{aligned} \text{Inventory Holding Cost for the six months} &= ₹2,57,600 \\ &= (\text{₹}22,750 + \text{₹}46,900 + \text{₹}39,200 + \\ &\quad \text{₹}45,850 + \text{₹}66,850 + \text{₹}36,050) \end{aligned}$$

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 Availability*	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 KPL 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) KPL 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) KPL should also aim to improve quality at its process and design levels with the purpose of achieving "Zero Defects" in the production process.
 - (iv) KPL should also keep in mind the efficiency of its work force. KPL 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 Electro Life 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
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
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. (i) Impact of Management Consultant's Plan on Profit of the HHCL

Human Health Care Ltd.

Statement Showing Cost Benefit Analysis

Particulars	₹
Cost:	
Incremental Cost <i>due to</i> Increased Readmission	25,00,000
Benefit:	
Saving in General Variable Cost <i>due to</i> Reduction in Patient Days [15,000 Patients × (2.5 Days – 2.0 Days) × ₹500]	37,50,000
Revenue from Increased Readmission (300 Patients × ₹4,500)	13,50,000
Incremental Benefit	26,00,000

(ii) Comment

Primary goal of investor-owned firms is shareholder wealth maximization, which translates to stock price maximization. Management consultant's plan is looking good for the HHCL as there is a positive impact on the profitability of the company (refer Cost Benefit Analysis).

Also HHCL operates in a competitive environment so for its survival, it has to work on plans like above.

But there is also the second side of a coin that cannot also be ignored i.e. humanity values and business ethics. Discharging patients before their full recovery will add discomfort and disruption in their lives which cannot be quantified into money. There could be other severe consequences as well because of this practice. For gaining extra benefits, HHCL cannot play with the life of patients. It would put a question mark on the business ethics of the HHCL.

May be HHCL would able to earn incremental profit due to this practice in *short run* but It will tarnish the image of the HHCL which would hurt profitability in the *long run*.

So, before taking any decision on this plan, HHCL should analyze both *quantitative as well as qualitative factors*.

7.

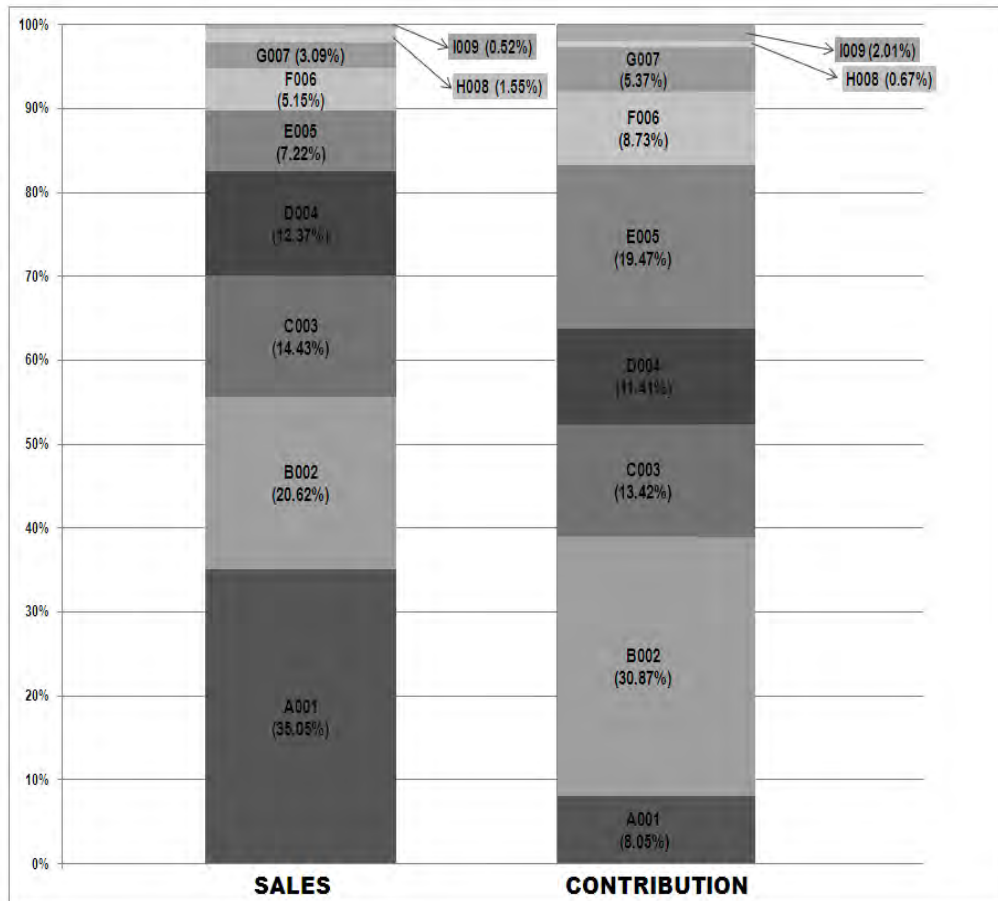
Statement Showing 'Pareto Analysis'

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. A single budget system may be conflicting in planning and motivation, and planning and performance evaluation roles as below:
 - (i) Planning and motivation roles – Demanding budgets that may not be achieved may be appropriate to motivate maximum performance but they are unsuitable for planning purposes. For these, a budget should be a set based on easier targets that are expected to be met.
 - (ii) Planning and performance evaluation roles - For planning purposes budgets are set in advance of the budget period based on an anticipated set of circumstances or environment. Performance evaluation should be based on a comparison of active performance with an adjusted budget to reflect the circumstance under which managers actually operated.
9. Fixed Overhead Expenditure Variance = Budgeted Fixed Overheads – Actual Fixed Overheads

₹20,000 (F)	=	₹7,20,000 – Actual Fixed Production Overheads
Actual Fixed Overheads	=	₹7,00,000
Absorbed Fixed Overheads	=	Actual Fixed Overheads + Over Absorbed Fixed Overheads
	=	₹7,00,000 + ₹3,200
	=	₹7,03,200
Standard Absorption Rate <i>per unit</i>	=	₹7,20,000 / 36,000 units
	=	₹20
So, Actual Number of Units	=	₹7,03,200 / ₹20
	=	35,160 units

10. 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 (<i>per unit</i>)	=	$\frac{₹8,34,000}{₹2,00,000} = ₹4.17$
Budgeted Sales Price <i>per unit</i>	=	$\frac{₹21,00,000}{₹2,00,000} = ₹10.50$

$$\text{Actual Sales Price per unit} = \frac{\text{₹16,92,900}}{\text{₹1,65,000}} = \text{₹10.26}$$

$$\text{Standard Variable Cost per unit} = \frac{\text{₹12,66,000}}{\text{₹2,00,000}} = \text{₹6.33}$$

$$\text{Actual Variable Cost per unit} = \frac{\text{₹10,74,150}}{\text{₹1,65,000}} = \text{₹6.51}$$

Calculation of Variances

Sales Variances:.....

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

(*) *Market Size Variance*

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

(**) *Market Share Variance*


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

Variable Cost Variances:.....

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

Fixed Cost Variances:.....

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

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

11. (i) The minimum price at which CECDC can transfer component 'L_x' to CIPL is Variable Cost per unit *plus* Corporate Tax attributable to per unit of component 'L_x'

Minimum Transfer Price *per unit* of component 'L_x'

	Amount (TWD)
Direct Material	440.00
Direct Labour	120.00
Variable Overheads	40.00
Wharfage Charges	30.00
Corporate Tax attributable to per unit of component 'L _x ' (W.N.1)	30.00
Total	660.00

Minimum Transfer Price *per unit* of component 'L_x' is 660 TWD or ₹1,320

- (ii) Maximum Transfer Price that CIPL can pay to CECDC for every unit of component 'L_x' is the market price of component 'L_x' in domestic market *minus* cost of import (if any).

Maximum Transfer Price *per unit* of component 'L_x'

	Amount (₹)
Market Price of component 'L _x ' (Indian Market)	1,490.00
<i>Less:</i> Import Duty (750 TWD × 2 × 10%)	150.00
<i>Less:</i> Shipment Cost	10.00
Total	1,330.00

Maximum Transfer Price that CIPL can pay to CECDC for every unit of component 'L_x' is ₹1,330 or 665 TWD.

- (iii) **Profitability Statement for the Group (TWD' 000)**

Particulars	LED TV	Component 'L _x '	Total
Sales Revenue	9,62,500 (1,75,000 units × ₹11,000 × 0.50)	1,12,500 (1,50,000 units × 750TWD)	10,75,000
Total Revenue	(A)		10,75,000
Variable Manufacturing Cost (Component 'L _x ')	2,10,000 (3,50,000 units × 600 TWD)	90,000 (1,50,000 units × 600TWD)	3,00,000
Wharfage Charges	10,500 (3,50,000 units × 30 TWD)	4,500 (1,50,000 units × 30TWD)	15,000
Other Variable Manufacturing	5,52,562.50	---	5,52,562.50

Cost (excluding 'Lx')	(1,75,000 units × ₹6,315 × 0.50)		
Import Duty	26,250 (10% × 3,50,000 units × 750TWD)	---	26,250
Shipment Cost	1,750 (3,50,000 units × ₹10 × 0.50)	---	1,750
Office and Admin. Overheads	5,900 (₹1,18,00,000 × 0.50)	---	5,900
Selling & Dist. Overheads	12,900 (₹2,58,00,000 × 0.50)	---	12,900
Corp. Taxes (W.N. 2 & 3)	30,191.25 (₹60,382.50 × 0.50)	15,000	45,191.25
Total Cost		(B)	9,59,553.75
Profit		(A) – (B)	1,15,446.25

Working Notes:**W.N.-1****Corporate Tax Attributable to *per unit* of Component 'Lx' (TWD)**

	Amount
Profit <i>per unit</i> (750 TWD – 440 TWD – 120 TWD – 40 TWD – 30 TWD)	120
Corporate tax <i>per unit</i> (25% on 120 TWD)	30

W.N.-2**Calculation of Corporate Tax paid by CIPL (₹' 000)**


	Amount
Sales Revenue (1,75,000 units × ₹11,000)	19,25,000
<i>Less: Variable Costs:</i>	
Component 'Lx' (3,50,000 units × 750 TWD × ₹2)	5,25,000
Other Variable Costs (1,75,000 units × ₹ 6,315)	11,05,125
<i>Less: Import Duty 10% of (3,50,000 units × 750 TWD × ₹2)</i>	52,500
<i>Less: Shipment Cost (3,50,000 units × ₹10)</i>	3,500
<i>Less: Fixed Overheads</i>	
Office and Administrative Overheads	11,800
Selling and Distribution Overheads	25,800
Taxable Profit	2,01,275
Tax Payable @30%	60,382.50

W.N.-3

Calculation of Corporate Tax paid by CECD (TWD)

	Amount
Profit <i>per unit</i> (750 TWD – 440 TWD – 120 TWD – 40 TWD – 30 TWD)	120
No. of units to be sold	5,00,000
Total Profit (120 TWD × 5,00,000 units)	6,00,00,000
Corporate Tax @ 25%	1,50,00,000


12.

 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-

 Δ_{ij} Matrix

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

Since all values of Δ_{ij} are not positive, the solution given above is not optimal. Let us include the cell with highest negative Δ_{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		1
	+1		-1
	1		
	-1		+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 degeneracy to remove this situation a new 'e' has been allocated to least cost independent cell C₂₂.

(u_i + v_j) Matrix for Allocated / Unallocated Cells

				u _i
	112.50	100.00	110.00	0
	117.50	105.00	115.00	5.00
	122.50	110.00	120.00	10.00
	102.50	90.00	100.00	-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-

Δ_{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 Δ_{ij} Matrix table are non-negative, this solution is optimal. The optimal assignment is given below-

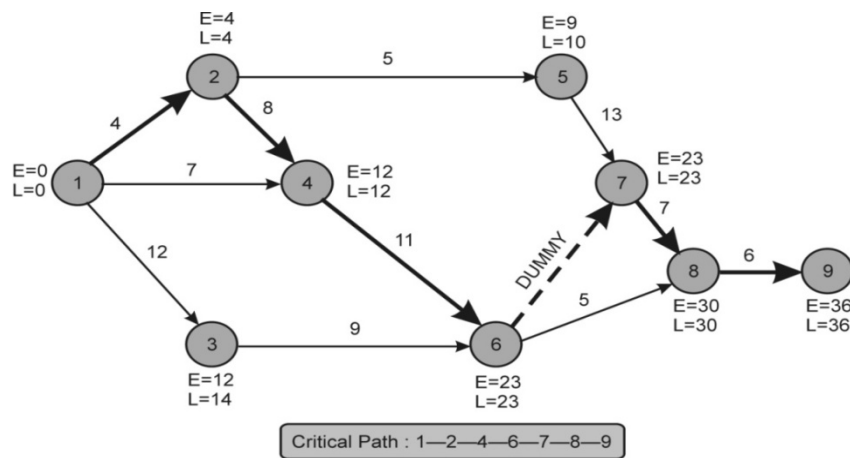
Contractor	Job	Cost of Project
A	Q	100.00
B	S	137.50
C	R	120.00
D	P	102.50
Total		460.00

13. (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
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.

14. (i) Invalid

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

15. 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.

16. 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)

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

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

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

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

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

$$\begin{aligned} \log y &= 0.63096 \\ y &= \text{antilog of } 0.63096 \\ y &= 4.275 \text{ hrs} \\ \text{Total time for 14 units} &= 14 \text{ units} \times 4.275 \text{ hrs} \\ &= 59.85 \text{ hrs} \end{aligned}$$

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

$$\begin{aligned} \text{Total time for first 15 units} &= 62.72 \text{ hrs} \\ \text{Total time for next 10 units} &= 28.70 \text{ hrs } [(62.72 - 59.85) \text{ hours} \times 10 \text{ units}] \\ \text{Total time for 25 units} &= 62.72 \text{ hrs} + 28.70 \text{ hrs} \\ &= 91.42 \text{ hrs} \end{aligned}$$

W.N.2

Computation of Standard and Actual Rate

$$\begin{aligned} \text{Standard Rate} &= \frac{\text{₹}1,19,288}{180.74 \text{ hrs.}} \\ &= \text{₹ } 660.00 \text{ per hr.} \\ \text{Actual Rate} &= \frac{\text{₹}79,704}{118.08 \text{ hrs.}} \\ &= \text{₹ } 675.00 \text{ per hr.} \end{aligned}$$

W.N.3

Computation of Variances

$$\begin{aligned} \text{Labour Rate Variance} &= \text{Actual Hrs} \times (\text{Std. Rate} - \text{Actual Rate}) \\ &= 118.08 \text{ hrs} \times (\text{₹}660.00 - \text{₹}675.00) = \text{₹}1,771.20 \text{ (A)} \\ \text{Labour Efficiency Variance} &= \text{Std. Rate} \times (\text{Std. Hrs} - \text{Actual Hrs}) \\ &= \text{₹}660 \times (91.42 \text{ hrs} - 118.08 \text{ hrs}) \\ &= \text{₹}17,595.60 \text{ (A)} \end{aligned}$$

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

17. Cost Classification

(i) Committed Cost

Reason: Company cannot negotiate the price of advertisement in future and it has to make payment as soon as advertisement is prepared.

(ii) Differential Cost

Reason: In case of decision making among two alternatives, every manager has to compare the difference in cost involved.

(iii) Sunk Cost

Reason: Research expense has already been incurred and it will not affect any decision making in future.

(iv) Opportunity Cost

Reason: Income from government securities is the amount that company has forgone to earn income from its investment in the project.

(v) Period Cost

Reason: Salary of chairman is paid irrespective of productivity of the company.

(vi) Direct Cost

Reason: Amount paid for water can be directly attributed to the cost of finished product that is clothes.

18. (i) Predatory Pricing

Predatory Pricing occurs when a firm with significant market power sets prices at a sufficiently low level with the purpose of damaging or forcing a competitor to withdraw from the market. It may involve dumping, i.e. selling a product in a foreign market at below cost, or below the domestic market price (subject to, for example, adjustments for taxation differences, transportation costs, specification differences).

(ii) Shadow Price

Increase in value which would be created by having available one additional unit of a limiting resource at its original cost. This represents the opportunity cost of not having the use of the one extra unit.

(iii) 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.

(iv) **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:

