Paper- 15: MANAGEMENT ACCOUNTING-PERFORMANCE MANAGEMENT

Time Allowed: 3 Hours **Full Marks: 100**

The figures in the margin on the right side indicate full marks.
Attempt Question No. 1 (carrying 25 marks), which is compulsory and any five more questions (each carrying 15 marks) from the rest.

Working Notes should form part of the answer.

"Wherever necessary, suitable assumptions should be made and indicated in answer by the candidates."

1.

a) State whether the following statements given below are 'True' or 'False'. If True, simply rewrite the given statement (= 1 mark). If False, state it as False (= ½ marks) and rewrite the correct statement (=½ mark): [5]

i) The term Value has four different meanings- Exchange value, cost value, use value and wealth value.
ii) ERP bridges the information gap across the organization.
iii) In fact, the 'effectors' is another name for management information system.(MIS)
iv) A 'level strategy', one of Aggregate Planning Strategies, implies matching demand and capacity period by period.
v) The key factors of 'Theory of Constraints' are Contribution and Profit.

b) Fill in the blanks with the most appropriate words: [5]

i) …… Philosophy suggests that a firm should eliminate any reliance upon the EOQ.
ii) …….. is a Japanese strategy for continuous improvement.
iii) The concept of …… emphasizes linkage among all of the value-adding activities.
iv) A Customer FAST diagram is usually applied to ……. product.
v) …….. has become a standard practice among many organizations as a way to add flexibility to chain.

c) Choose the correct one: [5×2=10]

i) A company makes and sells a single product. The selling price and marginal revenue equations are: Selling price = ₹ 50 – ₹ 0.001X
Marginal revenue = ₹50 –₹0.002 X
Where X is the no. of product the company makes. The variable costs amount to ₹ 20 per unit and the fixed costs are ₹1,00,000.
In order to maximize the profit, the selling price should be
A. ₹ 32
B. ₹ 25
C. ₹ 35
D. ₹40

ii) Nova Manufacturing Company manufactures two products using common material handling facility. The total budgeted material handling cost is ₹ 60,000. The other details are:

	Product X	Product Y
Number of units produced	30	30

Material moves per product line	5	15
Direct labour hour per unit	20	20

Under Activity Based Costing system the material handling cost to be allocated to product X (per unit) would be:

A. ₹1,000
B. ₹ 500
C. ₹1,500
D. ₹ 2,500

iii) The current price of a product is ₹8,000 per unit and it has been estimated that for every ₹200 per unit reduction in price, the current level of sale, which is 10 units, can be increased by 1 unit. The existing capacity of the company allows a production of 15 units of the product. The variable cost is ₹4,000 per unit for the first 10 units; thereafter each unit will cost ₹400 more than the preceding one. The most profitable level of output for the company for the product will be

A. 11 units
B. 12 units
C. 13 units
D. 14 units

iv) A company is preparing a quotation for a new product. The time taken for the first unit is 30 hours. The company expects 85% learning curve (index is –0.2345). The company desires that the quotation should be based on the time taken for the final output within the learning period which is expected to end after the company has produced 200 units.

The time per unit of product to be used for the quotation is:

A. 13.34 hours
B. 25.50 hours
C. 30.00 hours
D. 6.67 hours

v) A company proposes to undertake a capital project. The life of the project is 4 years and the annual cash inflows are estimated at ₹40,000. The internal rate of return of the project is 15% and the cumulative present value factor for 15% for 4 years is 2.855. The profitability index is 1.064.

The net present value of the project is

A. ₹ 6,870
B. ₹ 10,000
C. ₹ 10,000
D. ₹ 14,200

d) Expand the following abbreviations: [5]

i) JUSE
ii) FMEA
iii) EFQM
iv) SCRS
v) CPOF

Answer:

a)

i) **False.** The term Value has four different meanings- Exchange value, cost value, use value and Esteem value.

ii) **True**. The ERP System, which provides a platform for integrating the enterprises wide data base, into a meaningful management information system for decision making, becomes a very useful tool in the hands of the Cost Manager.

iii) **False.** The correct term is 'Detector' and not 'Effectors'

iv) **False,** The correct statement is 'chase strategy' and not 'Level strategy'.

v) **False.** The key factors of 'Theory of Constraints' are throughout Inventory & operating expenses.

b)

i) JIT
ii) Kaizen
iii) Supply chain management
iv) Total
v) Outsourcing

c)

i) **'C' is correct**
Selling Price = ₹ (50-0.001 x)
Marginal revenue = ₹ (50-0.002x)
Variable cost per unit= Marginal cost per unit = ₹20
Optimal output for maximum profit: 20 = 50 - 0.002x
When, X = 30/0.002= 15,000 units
SP = 50 - 0.001x = 50 - 0.001 (15,000)= 50-15 = ₹35

ii) '**B' correct**.
Total moves in material handling = 5+15=20
Percentage move for Product X = 5/20=25%

Material handling cost to be allocated to Product X
= ₹60,000/25% = ₹15,000 i.e., ₹15,000/30 = ₹500 per unit.

iii) '**B' correct.**

Units	Total Variable Cost	Selling Price Per unit	Total Revenue	Total Contribution
	₹	₹	₹	₹
10	40,000	8,000	80,000	40,000
11	40000+4400=44,400	7,800	85,800	41,400
12	44000+4800=49,200	7,600	91,200	42,000
13	49200+5200=54,400	7,400	96,200	41,800
14	54400+5600=60,000	7,200	1,00,800	40,800

iv) **'D' correct**

Average time per 200 units

$Y = 30 \times 200^{-0.2345}$

Taking logarithm of both sides:-

log Y = log 30 – 0.2345 log 200

or, log Y = 1.4771 – 0.2345 x 2.3010

or , log Y = 1.4771 – 0.5396

or, log Y = 0.9375

Taking antilog of both sides

Antilog (log Y) = Antilog (0.9375)

Y = 8.66 hours

Average time per 199 units

$Y = 30 \times 199^{-0.2345}$

Taking logarithm of both sides:-

log Y = log 30 – 0.2345 log 199

or, log Y = 1.4771 – 0.2345 x 2.2989

or , log Y = 1.4771 – 0.5391

or, log Y = 0.938

Taking antilog of both sides

Antilog (log Y) = Antilog (0.938)

Y = 8.67 hours

Total hours for 200 units = 8.66 x 200 = 1732.00

Total hours for 199 units = 8.67 x 199 = 1725.33

6.67 hours

v) '**A' is the correct answer.**

Present values of Cash Inflows = 40,000 x 2.855 = 1,14,200

$$\text{Profitability Index} = \frac{\text{P.V. of Cash inflow}}{\text{P.V. of Cashoutflow}}$$

$$\text{or, } 1.064 = \frac{1{,}14{,}200}{\text{P.V.of Cash Outflow}}$$

$$\text{or, P.v.of Cash Outflow} = \frac{1{,}14{,}200}{1.064}$$

Or, P.V,. of Cash outflow = 1,07,330

Therefore N.P.V = 1,14,200 – 1,07,330 = ₹ 6,870

d)

i) JUSE: Japanese Union of Scientists and Engineers
ii) FMEA: Failure Mode and Effects Analysis
iii) EFQM: European Foundation for Quality Management
iv) SCRS: Setup Cost Reduction System
v) CPOF: Capacity Planning Using Overall Factors.

2.

a) Write down a list of recommendations to facilitate initially using QFD. [5]

b) Kotoky Company of Hyderabad imports exotic perfume, named AXC, from France and

markets same to shops in India. As the perfume market is very competitive, the company's directors believed that a change in marketing strategy would be beneficial. By reducing the selling price to the shops they wanted to achieve a greater sales volume. The company was able to negotiate a lower price with the French bottler for all of its purchases. This strategy did not have any effect on the company's fixed costs. The change in marketing strategy took place on 1 April 2012.

Kotoky's AXC sales results for 2011-2012 and 2012-2013 are summarized as under:

	2011 – 12	2012 - 13
1. Number of bottles of AXC bought and sold	10 Lakhs	12 Lakhs
2. Selling price bottle	₹50	₹40
3. Cost price per bottle	₹30	₹27

Required:

(i) Calculate the change in contribution caused by the change in strategy.

(ii) Analyse the figure calculated in (i) into the growth aspect, the price aspect, and the productivity (usage) aspect.

(iii) Briefly explain and comment on how successful the change in strategy was and why.

[3+3+4=10]

Answer:

a) The following is a list of recommendations to facilitate initially using QFD.

i) Obtain management commitment to use QFD

ii) Establish clear objectives and scope of QFD use. Avoid first using it on a large, complex project if possible. Will it be used for the overall product or applied to a subsystem, module, assembly or critical part? Will the complete QFD methodology be used or will only the product planning matrix be completed?

iii) Establish multi-functional team. Get an adequate time commitment from team members.

iv) Obtain QFD training with practical hands-on exercises to learn the methodology and use a facilitator to guide the initial efforts.

v) Schedule regular meetings to maintain focus and avoid the crush of the development schedule overshadowing effective planning and decision-making.

vi) Avoid gathering perfect data. Many times significant customer insights and data exist within the organization, but they are in the form of hidden knowledge-not communicated to people with the need for this information. On the other hand, it may be necessary to spend additional time gathering the voice of the customer before beginning QFD. Avoid technical arrogance and the belief that company personnel know more than the customer.

b) Kotoky co. Income statement

	2011-12 ₹ in lakh	2012-13 ₹ In lakh
Sales	500	480
Less: cost of sales	300	324
Contribution	200	156
Decline in contribution = ₹44 lakh is due to change in strategy.		

Analysis of decline noted above:

Growth aspect	₹ Lakh:
Revenue growth (12 L -10 L)x ₹50	100(F)
Cost of growth due to increase in value of sales(12-10)x ₹30	60(A)

Net	40(F)
Price aspect	
Decrease in revenue due to reduction in SP12L x ₹10 =	120 (A)
Cost (purchase price decrease) 12 lakh x ₹ 3	36 (F)
Net	84 (A)

Productivity or Usage Aspect:
Overall Summary

Growth aspect	40(F)
Price aspect	84 (A)
Productivity aspect	NIL
Reduction in contribution	44L

Note: Since the no. of bottles needed to make each sale remained at one (as it had to), the effect is NIL

3.

a) What are the benefits accruing from implementation of a TQM programmed in an organization? [5]

b) The operating results of a department provide the following information for a particular week:

Average output per week	**48,000 unit**
Saleable value of output	**₹60,000**
Contribution on above	**₹24,000**

The management is contemplating to bring about more mechanisation in the department at a capital cost of ₹16,000 which will result in reduction in number of workmen from the present strength of 160 nos. to 120 nos. However, due to mechanical help, the output of individual workmen will increase by 60%. The existing piece rate is ₹ 0.10 per article and as an incentive, the management propose to increase the existing piece rate by 5% for every 10% increase in the individual output achieved. There will be a reduction in sale price by 4% to sell the increased production.
You are required to calculate extra weekly contribution resulting due to proposed changes. [10]

Answer:

a) Implementation of TQM leads to the following benefits to a firm-
i) Increased awareness of Quality Culture in the Firm,
ii) Commitment to Continuous Improvement,
iii) Greater focus on Customer satisfaction,
iv) Greater emphasis on Team Work, and
v) Better control over processes, operations and costs.

b)

(i) Sales per week	₹60,000
Contribution	₹24,000
Variable cost	36,000
Less: wages (0.10 x 48,000 Pc)	4,800

Variable cost excluding wages		**₹31,200**
Variable cost excluding wages per pc i.e. 31,200/48,000 =		₹0.65
(ii) Future expected production per workmen		
Production per employee = 48,000/160 =		300
Add: increase by 60%		180
		480
Total future production from 120 workmen(120×480)		**57,600 units**
(iii) Expected selling price p.u.		
Present price ₹60,000/48,000 =		1.25
Less: Reduction by 4%		0.05
Revised price		**1.20**
(iv) Revised piece rate wages per unit		
Present rate		0.10
Incentives (5% x 60% = 3%)		0.03
		0.13
(v) Forecast of profitability		
Sales (57,600 units x ₹1.20)		69,120
Less: Variable cost		
Wages @ ₹ 0.13	7,488	
Other overheads (excluding wages @ ₹0.65)	37,440	44,928
Contribution:		24,192
Present contribution		24,000
Increase in contribution		**₹192**

So, extra weekly contribution due to proposed changes is ₹192

4.

a) As a result of change in consumer preference the company of which you are the Management Accountant finds that certain materials in stock which were bought for ₹ 7,000 a few year ago have not moved for a long time. The current replacement price of these material is ₹ 8,000. If these materials were disposed of by sale, they would fetch a net realizable value of ₹ 4,000 only.

The company has the opportunity of carrying out a one time job (Job 101) which can utilize material and yield a revenue of ₹ 16,000. The additional costs, other than the cost of these materials, chargeable to this will amount to ₹ 14,200. This charge includes the apportionment of general administration overhead amounting to ₹ 3,800, but the incurrence of all other expenses is dependent upon the execution of job 101.

Alternatively, the materials in question could be used as a substitute for other materials in another regular job (Job 208). The materials so replaced will otherwise cost ₹ 6,000. These costs have been included in the viability of job 208 which is expected to yield an additional net benefit of ₹ 11,000.

The company has thus three alternatives namely:

I. use of the material in Job 208

II. use the material in Job 101 and carry out Job 208 by buying in the material required; and

III. sell the materials and carry out Job 208 by buying in the materials required.

You are required to:

i) State with reasons the costs which are irrelevant to the decision of alternative choices.

ii) Evaluate the three alternatives given above by using the concept of;

A. Incremental cost and benefit analysis;
B. Opportunity cost and benefit analysis.

iii) State which of the alternative should be accepted by the company. [3+5+2=10]

b) In what circumstances is a company justified in selling its products at a price below variable cost? [5]

Answer

a)

i) The following costs are irrelevant to the decisions of alternative choices:

1) The materials worth ₹ 7,000 was bought a few years ago cannot be used for the original job. Therefore, materials amounting to ₹ 7,000 is the sunk cost which is irrelevant for cost and benefit analysis.
2) Apportionment of general administration overheads amounting to ₹ 3,800 to one-time Job 101 is irrelevant as this amount represents fixed cost which cannot be considered relevant to the present analysis.
3) Decision to use the material as substitute in a regular job (Job 208). This is expected to yield an additional net benefit of ₹ 11,000. The undertaking of Job 208 (a regulate job) is already committed and therefore, this cost is irrelevant to the analysis.

ii)

A. Incremental cost and benefit analysis

Any incremental cost and benefit analysis required certain base to be used. For the present analysis, Job 208 is a regular job and the same has been used as a base for incremental cost and benefit analysis.

Details costs	Execute job 208	Use the materials of job 101	Selling the existing materials
Cost of job 101(additional cost less fixed overheads)	-	10,400	-
Purchase for materials for job 208	-	6,000	6,000
Total costs benefits	-	16,400	6,000
Sales of existing material	-	-	4,000
Revenue from job 101		16,000	-
Total benefit		16,000	4,000
Net cost/benefit		(400)	(2,000)

(In both above alternatives the costs are more than the benefits).

B. Opportunity cost analysis

Opportunity cost		10,400	
Benefits (by using materials)	6,000	16,000	4,000
Net Benefit	6,000	5,600	4,000

iii) As the benefit is maximum if the material is used in Job 208, it is advisable to use the materials in job 208.

b) A company is justified in selling its product below the variable cost in the following circumstances:

(i) Where the product is of perishable nature
(ii) Where heavy stocks have been accumulated.
(iii) where it is decided to use the product as loss leader i.e. to boost the sales of other products
(iv) where the product is intended to be popularized by an introductory/temporary offer
(v) where it is intended to be an entry barrier to the would-be competitor
(vi) Where it is to serve some social purpose.

5.

a) The Secretary of a School is taking bids on the City's four school bus routes. Four companies have made the bids as detailed in the following table:

Company	Bids for Routes (in ₹)			
	R1	R2	R3	R4
C1	4000	5000	----	----
C2	----	4000	----	4000
C3	3000	----	2000	----
C4	----	----	4000	5000

Each bidder can be assigned only one route. Determine the minimum cost of running the four bus routes. [10]

b) What are the problems associated with sensitivity analysis in a business context? [5]

Answer:

a) The objective is minimization and data is balanced. However, where assignment is not possible, e.g. Company C1 has not bid for Routes R3 and R4, the prohibited routes are assigned a high cost M, where M = infinity.

I. Given Cost Matrix (000's)

4	5	M	M
M	4	M	4
3	M	2	M
M	M	4	5

II. Row Operations

0	1	M	M
M	0	M	0
1	M	0	M
M	M	0	1

III. Col. Ops & Drawing Lines,

~~0~~	~~1~~	~~M~~	~~M~~
~~M~~	~~0~~	~~M~~	~~0~~
1	M	0	M
M	M	0	1

Lines = 3, Order = 4, LOE = 1

IV. Revising Matrix & drawing lines:

~~0~~	~~1~~	~~M~~	~~M~~
~~M~~	~~0~~	~~M~~	~~0~~
~~0~~	~~M~~	~~0~~	~~M~~
~~M~~	~~M~~	~~0~~	~~0~~

V. Optimal Assignment

[0]	1	M	M
M	[0]	M	~~0~~
~~0~~	M	[0]	M
M	M	~~0~~	[0]

Answer:

Co.	Route	Cost (₹)
C1	R1	4,000
C2	R1	4,000
C3	R1	2,000
C4	R1	5,000
Minimum Cost		15,000

b) There are some problems associated with sensitivity analysis in a business context.

i) Variables are often interdependent, which makes examining them each individually unrealistic e.g. changing one factor such as sales volume, will most likely affect other factors such as selling price.

ii) often the assumption upon which the analysis is based are made using past data/experience which may not hold in the future.

iii) Assigning a maximum and minimum or optimistic and pessimistic value is open to subjective interpretation and risk preferences of the decision maker. For instance one person's optimistic forecast may be more conservative than that of another person performing a different part of the analysis. This sort of subjectivity can adversely affect the accuracy and overall objectivity of the analysis.

iv) S. A. is neither a risk-measuring nor a risk reducing technique. It does not produce any clearer decision rule.

6.

a) X uses traditional standard costing system. The inspection and setup costs are actually ₹ 1,760 against a budget of ₹ 2,000.

ABC system is being implemented and accordingly, the number of batches is identified as the cost driver for inspection and setup costs. The budgeted production is 10,000 units in batches of 1,000 units, whereas actually, 8,800 units were produced in 11 batches.

(i) Find the volume and total fixed overhead variance under the traditional standard costing system.

(ii) Find total fixed overhead cost variance under the ABC system. [4+6]

b) Write down the quality management principle for improved organization performance. [5]

Answer:

a)

(i) Calculation of volume and total fixed overhead under Traditional Standard Costing System.

Budgeted overhead cost per unit	₹ 2,000/10,000 units	₹ 0.20
Actual overhead cost per unit	₹ 1,760/8,800 units	₹ 0.20
Total fixed over head variance	Absorbed budgeted overhead – Actual overhead = (₹ 0.20 x 8,800 units) – ₹ 1,760	Nil
Fixed overhead expenditure variance	Budgeted overhead – Actual overhead = 2,000 – 1,760	₹ 240 (F)
Standard absorption rate	₹ 2,000 / 10,000 units	₹ 0.20 per unit
Verification:	Standard absorption rate x (Budgeted units – Actual units) = ₹ 0.20 (10,000 units – 8,800 units)	₹ 240 (A)
Total fixed overhead variance	Expenditure variance + Volume variance = 240 (F) + 240 (A)	Nil

(ii) Calculation of fixed overhead cost variance under ABC System

Particulars	Budget	Actual	ABC standard
Total cost (₹)	2,000	1,760	1,800
Production (units)	10,000	8,800	8,800
No. of batches	10	11	9
Batch size (units/batch)	1,000	800	1,000
Cost per batch	200	160	200

Under ABC 8,800 units should have been produced in standard batch size of 1,000 units/ batch.

No. of batches = 8,800/1,000 = 9 approx.

Standard cost under ABC =

(Budgeted cost per batch x ABC standard number of batches)

= ₹ 200 x 9 = 1,800

Under ABC, variability is with respect to batches and not units

Absorbed overheads = 9 batches x Standard rate per batch

= 9 x ₹ 200 = ₹ 1,800

Actual overheads = ₹ 1,760

Total overheads cost variance = ₹ 40 (F)

b) Quality management principles for improved organization performance

The adoption of a QMS should be a strategic decision by top management for survival and growth of the organization. It has been clearly demonstrated and proven that those organizations that focus their efforts firmly onto understanding the needs and expectation of their customers and then systematically set about planning and managing their operations in order to deliver in a consistent and reliable fashion at an overall acceptance cost generally survive and grow.

A Quality Management Principle is a comprehensive and fundamental rule or belief, for leading and operating an organization aimed at continually improving performance over the long-term by focusing on customers while addressing the needs of all other

stakeholders,

PRINCIPLE-1 : CUSTOMER FOCUS

Organizations depend on their customers and therefore should understand current and future customer needs, should meet customer requirements and strive to exceed customer expectations.

PRINCIPLE-2: LEADERSHIP

Leaders establish unity of purpose and direction of the organization. They should create and maintain the internal environment in which people can become fully involved in achieving organization's objectives.

PRINCIPLE-3: INVOLVEMENT OF PEOPLE

People of all levels are the essence of an organization and their full involvement enables their abilities to be used for the organizations benefit.

PRINCIPLE-4: PROCESS APPROACH

A desired result is achieved more efficiently when activities and related resources are managed as a process.

PRINCIPLE-5: SYSTEM APPROACH TO MANAGEMENT

Identifying, understanding and managing interrelated processes as a system contributes to organization's effectiveness and efficiency in achieving its objectives.

PRINCIPLE-6: CONTINUAL IMPROVEMENT

Continual improvement of the organization's overall performance should be a permanent objective of the organization.

PRINCIPLE-7: FACTUAL APPROACH TO DECISION MAKING

Effective decisions are based on the analysis of data and information.

PRINCIPLE-8: MUTUALLY BENEFICIAL SUPPLIER RELATIONSHIPS

An organization and its suppliers are interdependent and a mutually beneficial relationship enhances the ability of both to create value.

7.

a) Company manufactures a single product, which requires two components. The Company purchases one of the components from two Suppliers: X Ltd and Y Ltd.

The price quoted by X Ltd is ₹ 180 per hundred units of the component and it is found that on an average 3% of the total receipt from this Supplier is defective. The corresponding quotation from Y Ltd is ₹ 174 per hundred units, but the defective would go up to 5%. If the defectives are not detected, they are utilized in production causing a damage of ₹ 180 per 100 units of the component.

The Company intends to introduce a system of inspection for the components on receipt. The inspection cost is estimated at ₹ 24 per 100 units of the component. Such an inspection will be able to detect only 90% of the defective components received. No payment will be made for components found to be defective in inspection.

Required:

(i) Advise whether inspection at the point of receipt is justified?

(ii) Which of the Suppliers should be asked to supply? Assume total requirement is

10,000 units of the component. [4+6]

b) Explain the classes of Firms using MRP and MRPII. [5]

Answer:

a)

1. Computation of Cost per 100 units of good components without inspection

Particulars	X Ltd	Y Ltd
(a) Purchase Price	$\frac{10,000}{100} \times 180 =$ 18,000	$\frac{10,000}{100} \times 174$ = 17,400
(b) Production Damage	(18,000 x 3%) = 540	(17,400 x 5%) = 870
(c) Total Costs (a + b)	₹ 18,540	₹ 18,270
(d) Number of good components	(10,000 - 300) = 9,700 units	(10,000-500)= 9,500 units
(e) Cost per 100 good components (c ÷ d)	$\frac{18,540}{9,700 \text{ units}} \times 100$ = ₹191.13	$\frac{18,270}{9,500} \times 100$ = ₹192.31

2. Computation of Cost per 100 units of good components with inspection

Particulars	X Ltd	Y Ltd
(a) Total Units Required	10,000 units	10,000 units
(b) Defective Units	3% of 10,000 = 300 units	5% of 10,000 = 500 units
(c) Defectives not detected (10%)	30 units	50 units
(d) Defectives Detected	270 units	450 units
(e) Components paid for (a - d)	9,730 units	9,550 units
(f) Purchase Price	(9,730x 180) ÷100 = ₹ 17,514	(9,550 x 174) ÷100 = ₹ 16,617
(g) Inspection Cost	(10,000 x 24) ÷100 = ₹ 2,400	(10,000 x 24)÷ 100 = ₹ 2,400
(h) Production Damage	(30 x 180) ÷100 = ₹ 54	(50 x 174) ÷100 = ₹ 87
(i) Total Costs (f + g + h)	₹ 19,968	₹ 19,104
(j) Cost per 100 good components	$\frac{₹19,968}{9,700} \times 100$ = ₹ 205.86	$\frac{₹19,104}{9,500} \times 100$ x 100 = ₹201.09

Conclusion:

- Inspection at the point of receipt is not advantageous, due to additional cost per 100 good components, i.e. (₹ 205.86 – ₹ 191.13) = ₹ 14.73 in case of X Ltd, and (₹ 201.09 – ₹ 192.31) = ₹ 8.78 in case of Y Ltd.
- Purchase from X Ltd is cheaper, as there is cost saving of ₹ 1.18 per 100 good components.

b) Classes of Firms Using MRP and MRP II

MRP and MRP II users are classified by the degree to which they utilize the various aspects of these systems. Class D companies have MRP working in their data processing area, but utilize little more than the inventory status file and the master production schedule, both of which may be poorly used and mismanaged. Typically, these firms are not getting much return for the expense incurred by the system.

Class C firms use their MRP system as an inventory ordering technique but make little use of its scheduling capabilities.

Class B companies utilize the basic MRP system (MPS, BOM, and Inventory file) with the addition of capacity requirements planning and a shop floor control system. Class B users

have not incorporated purchasing into the system and do not have a management team that uses the system to run the business, but rather see it as a production and inventory control system.

Class A firms are said use the system in a closed loop mode. Their system consists of the basic MRP system, plus capacity planning and control, shop floor control, and vendor scheduling systems. In addition, their management uses the system to run the business. The system provides the game plan for sales, finance, manufacturing, purchasing, and engineering. Management then can use the system's report capability to monitor accuracy in the BOM, the inventory status file, and routing, as well as monitor the attainment of the MPS and capacity plans.

Class A firms have also tied in the financial system and have developed the system's simulation capabilities to answer "what if" questions. Because everyone is using the same numbers (e.g., finance and production), management has to work with only one set of numbers to run the business.

8. Write short notes on any three: [5×3=15]

(a) Uses of the learning curve.
(b) DRUM-BUFFER-ROPE.
(c) Step in strategies bench trending
(d) PDCA

Answer:

a) Uses of the learning Curve :

The learning curve theory has gained significant importance as a technique for cost prediction and cost control. Some of the uses to which the learning rate may be put to are as follows:-

(i) Developing bid prices for contracts

(ii) Work Scheduling - The learning curve concept assists the management in work scheduling and production control in three ways:
   (a) It predicts man-hours and the workforce required for meeting the production plan so that timely action may be taken to procure the required workforce.
   (b) It indicates the time required for production so that schedule deliveries can be maintained.
   (c) It enables production control to take advantage of reducing the time per unit of production by increasing the product lot sizes.

(iii) Planning Inventory - The learning curve indicates how with increased efficiency of the worker, the pace of production increases consequent to which more materials are required and work-in-progress and finished goods stocks grow rapidly in size. Awareness of the growth rate enables the management to plan the inventories properly.

(iv) Planning working capital - When unit prices are based on average cumulative cost per unit, the cost of the first few units produced will be higher than the cost on which the bid price was based. As a result, the profit level may not be high enough to provide sufficient working capital. In such a situation, the learning curve will indicate the quantum of the shortage of working capital so that suitable action may be taken on time to meet the shortfall.

(v) Make or buy decision - The learning curve is usedful in make or buy decision-making. While purchasing from outside on long term basis, it is to be seen whether the supplier has already reached the maximum efficiency in which case no learning curve will apply and no reduction in price in future can be expected. In another situation where instead of purchasing, internal production is speeded up, new inexperienced workers

may have to be employed resulting in high costs now but gradual lower costs may be expected when the improvement process operates.

b) DRUM-BUFFER-ROPE:

Drum-buffer-rope is a TOC production application and the name given to the method used to schedule the flow of materials in a TOC facility. Srikanth and Umble (1997), define each component as follows:

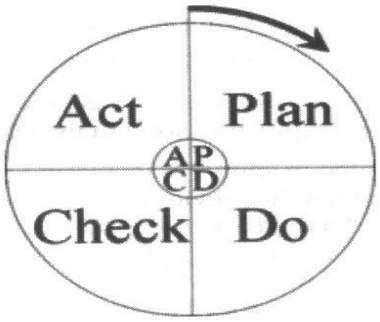
- **Drum**: The drum is the constraint and therefore sets the pace for the entire system. The drum must reconcile the customer requirements with the system's constraints. In simpler terms, the drum is the rate or pace of production set by the system's constraint.
- **Buffer**: A buffer includes time or materials that support throughput and/or due date performance. A buffer establishes some protection against uncertainty so that the system can maximize throughput. A time buffer is the additional planned lead time allowed, beyond the required setup and run times, for materials to reach a specified point in the product flow. Strategically placed, time buffers are designed to protect the system throughput from the internal disruptions that are inherent in any process. A stock buffer is defined as inventories of specific products that are held in finished, partially finished, or raw material form, in order to fill customer orders in less than the normal lead-time. Stock buffers are designed to improve the responsiveness of the system to specific market conditions.
- **Rope**: The rope is a schedule for releasing raw materials to the floor. The rope is devised according to the drum and the buffer. The rope ensures that non-capacity constraint resources are subordinate to the constraint. Restated, the rope is a communication process from the constraint to the gating operation that checks or limits material released into the system to support the constraint.

c) The Steps in strategies bench trending are as follows:

1) Firstly the market is defined by determining its size, customer preferences, competitors and relative business position of the company within the market.
2) The industry direction, technology shifts, geopolitical changes, customer changes and potential threats from outside sources are assessed.
3) The strongest current and potential competitors are then determined by evaluating the trends in industry.
4) Data on performance of competitors is gathered and the current and future performance of the unit is compared with that of its competitor.
5) A performance baseline for the business units, is then established and the relative performance of current and projected competition is estimated.
6) A set of initiatives which form the basis of an improvement plan are identified to maintain strengths while reducing projected gaps.

d) PDCA:

PDCA-PDCA ("Plan-Do-Check-Act") is an iterative four-step problem-solving process typically used in quality control. It is also known as the Deming Cycle, Shewhart cycle, Deming Wheel, or Plan-Do-Study-Act.



The shewhart Cycle

Plan: establish the objectives and processes necessary to deliver results in accordance with the specifications.

Do: Implement the processes.

Check: Monitor and evaluate the processes and results against objectives and specifications and report the outcome.

Act: Apply actions to the outcome for necessary improvement. This means reviewing all steps (Plan, Do, Check, Act) and modifying the process to improve it before its next implementation.

PDCA was made popular by Dr. W. Edwards Father of modern quality control; however it was always referred to by him as the "Shewhart cycle." Later in Deming's career, he modified PDCA to "Plan, Do, Study, Act" (PDSA) so as to better describe his recommendations.

The concept of PDCA comes out of the Scientific Method. The scientific method can be written as "hypothesis" - "experiment" - "evaluation" or Plan, Do, and Check. Shewhart described manufacture under "control" - under statistical control - as a three step process of specification, production, and inspection. The also specifically related this to the Scientific Method of hypothesis, experiment and evaluation. Shewhart, says that the statistician "must help to change the demand [for goods] by showing... how to close up the tolerance range and to improve the quality of goods." Clearly, Shewhart intended the analyst to take action based on the conclusions of the evaluation. PDCA has an inherent circular paradigm, it assumes that everything starts with Planning. Plan has a limited range of meaning. Shewart intended that experiments and quality control should be planned to deliver results in accordance with the specifications, which is good advice. However, Planning was not intended to cover aspects such as creativity, innovation, invention. In these aspects particularly when based upon imagination, it is often impossible or counterproductive to plan. Hence, PDCA is inapplicable in these situations.