FINAL EXAMINATION

GROUP III

(SYLLABUS 2016)

SUGGESTED ANSWERS TO QUESTIONS

JUNE 2019

Paper- 15: STRATEGIC COST MANAGEMENT – DECISION MAKING

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

The figures in the margin on the right side indicate full marks.

Section – A

1. Choose the most appropriate answer to the following questions giving justification: 2x10=20

(i) XYZ Ltd. has the following alternative planned activity levels.

Level	E	F	G
Total cost	₹ 1,00,000	₹ 1,50,000	₹ 2,00,000
No. of units produced	5000	10000	15000

If fixed overhead remains constant, then fixed overhead cost per unit at Level E is

(A) ₹ 20

(B) ₹15

(C) ₹ 13-33

(D) ₹ 10

(ii) T Ltd. produces and sells a product. The company expects the following revenues and costs in 2018:

Revenues (400 sets sold @ ₹600 per product)	₹ 2,40,000
Variable costs	₹1,60,000
Fixed costs	₹50,000

What amount of sales must T Ltd. have to earn a target net income of ₹ 63,000 if they have a tax rate of 30%?

(A) ₹ 4,20,000

(B) ₹4,29,000

(C) ₹ 3,00,000

(D) ₹ 4,89,000

(iii) Excel Products Ltd. manufactures four products e.g. Product E, Product F, Product G and Product H using same raw materials. The input requirements for Products E, F, G and H are 1kg, 2kgs, 5kgs and 7kgs, respectively. Product-wise Selling Price and Variable Cost data are given hereunder:

Products	E	F	G	H
Selling Price (₹)	100	150	200	300
Variable Cost (₹)	50	70	100	125

Assuming raw material availability is a limiting factor, the correct ranking of the products would be:

(A) E, F, G & H

(B) E, F, H & G

(C) F, E, G & H

(D) F,E,H&G

(iv) S Ltd. recently sold an order of 50 units having the following costs:

	₹
Direct materials	1,500
Direct labour (1000 hours @ ₹ 8-50)	8,500
Variable overhead (1000 hours @ ₹ 4-00)[1]	4,000
Fixed overhead[2]	1,400
	15,400

[1] Allocated on the basis of direct labour-hours.

[2] Allocated at the rate of 10% of variable cost.

The company has now been requested to prepare a bid for 150 units of the same product.

If an 80% learning curve is applicable, Stone Isle's total cost on this order would be

(A) ₹ 38,500

(B) ₹ 37,950

(C) ₹ 26,400

(D) ₹ 31,790

(v) A company manufactures and sells packaging machines. It recently introduced activity-based costing to refine its existing system. Each packaging machine requires direct materials costs of ₹ 50,000; 50 equipment parts; 12 machine hours; 15 assembly line hours and 4 inspection hours. The details about the cost pools, allocation bases and allocation rates are given below:

Indirect cost pool	*Cost allocation base*	*Budgeted allocation rate*
Material handling	**No. of component parts**	**₹ 8 per part**
Machining	**Machine hours**	**₹ 68 per machine hour**
Assembly	**Assembly line hours**	**₹ 75 per assembly hour**
Inspection	**Inspection hours**	**₹ 104 per inspection hour**

The company has received an order for 40 can-packaging machines from a customer. Using activity-based costing, indirect costs allocated to the order of the customer would be:

(A) ₹ 1,30,850

(B) ₹ 1,25,280

(C) ₹ 1,15,050

(D) ₹1,10,280

(vi) AB Ltd. uses standard cost system. The following information pertains to direct labour for Product X for the month of March, 2019:

Standard rate per hour	**₹ 8**
Actual rate per hour	**₹ 8.40**
Standard hours allowed for actual production	**2000 hours**
Labour Efficiency variance	**₹ 1,600 (Adverse)**

What were the actual hours worked?

(A) 1,800

(B) 1,810

(C) 2,200

(D) 2,190

(vii) X Ltd. has 1000 units of an obsolete item which are carried in inventory at the original price of ₹ 50,000. If these items are reworked for ₹ 20,000, they can be sold for ₹ 36,000. Alternatively, they can be sold as a scrap for ₹ 6,000 in the market. In a decision model used to analyse the reworking proposal, the opportunity cost should be taken as

(A) ₹ 16,000

(B) ₹ 6,000

(C) ₹ 30,000

(D) ₹ 20,000

(viii) Uniform Costing may *not* be successfully applied in the following case:

(A) In a single enterprise having a number of branches, each of which manufactures the same set of products with the same facilities.

(B) In a number of entities in the same industry bound by a trade association.

(C) In a number of units across different geographical locations manufacturing one or more of a given set of products.

(D) In different branches of the same company, each branch making a different product using a unique process.

(ix) Which of the following is a valid constraint for a linear programming problem?

(A) $3x^2 + 4x + 1 = 0$

(B) $5x_1 + 2x_2 \leq 10$

(C) $4x_x + 3x_2 > 7$

(D) $(12x_1 + 4x_2)/3x_2 \leq 8x_1$

(x) The shadow price of skilled labour for SD Ltd. is currently ₹10 per hour. What does this mean?

(A) The cost of obtaining additional skilled labour is ₹10 per hour.

(B) There is a hidden cost of ₹10 for each hour of skilled labour actively worked.

(C) Contribution will be increased by ₹10 per hour for each extra hour of skilled labour that can be obtained.

(D) The total costs will be reduced by ₹10 for each additional hour of skilled labour that can be obtained.

Answer:

1.

(i) (D)

Change in Costs (B – A) ₹ 50,000

Change in Units (B – A) ₹ 5,000

VC per unit = ₹50, 000 ÷ 5,000 = ₹ 10

Total Cost at A ₹ 1,00,000

VC : 5,000 × ₹ 10 50,000

Total FC ₹ 50,000 ÷ 5,000 units

= ₹ 10 per unit

(ii) (A)

$$\text{Required Sales} = \frac{FC + \frac{\text{Desired Profit}}{1 - \text{tax rate}}}{\frac{\text{Contribution}}{\text{Sales}}}$$

$$= \frac{₹\ 50,000 + 90,000}{1/3} = ₹\ 4,20,000$$

(iii) (B)

Ranking of products would in order of contribution per limiting factor, in relative value.

	E	F	G	H
SP (₹)	100	150	200	300
VC (₹)	50	70	100	125
Contribution per unit	50	80	100	175
RM/unit (kg)	1	2	5	7
Contribution per kg of RM (₹)	50	40	20	25
Rank	1	2	4	3

∴ Correct Order of ranking : E, F, H & G

(iv) (C)

Cumulative hours 200 × (20×0.8×0.8) = 2560

Less: 50×20 = 1000

Net hours for 150 units = 1560

Cost : Direct Materials 150×30 = 4,500

Direct Labour 1560 × 8.50=13,260

Variable Overhead 1560 × 4 = 6,240

Total Variable Cost = 24,000

Allocated Fixed OH = 10% = 2400

Estimated Cost of the Order = 26,400

(v) (D)

Indirect costs per machine:	₹
Material handling	₹ 8 × 50 = 400
Machining	₹ 68 × 12 = 816
Assembly	₹ 75 × 15 = 1,125
Inspection	₹ 104 × 4 = 416
	₹2,757

For the order: ₹ 2,757 × 40 = ₹ 1,10,280

(vi) (C)

Labour Efficiency Variance = (ST – AT) × SR

or, (2,000 – AT) × ₹ 8 = (–) ₹ 1,600

or, AT = 7,600 ÷ 8 = 2,200 hours

(vii) (B)

Original price is not relevant

Rework income	₹ 36,000
Less: Cost of rework	₹ 20,000
Net inflow	₹ 16,000, it is relevant

The other alternative relevant cash flow is from sale as scrap = ₹6,000

Hence the opportunity cost is ₹6.000

(viii) (D)

Though the entity is the same, different products using different (unique) process cannot follow uniform costing.

(ix) (B)

Other options do not conform to linearity or fundamental of constraints.

(x) (C)

A shadow price for a scarce resource is its opportunity cost.It is the amount of contribution that would be lost if one unit less of that resource were available.It is similarly the amount of additional contribution that would be earned if one unit more of that resource were available.(This is on the assumption that that the scarce resource is available at its normal variable cost).

Section-B

Answer *any five* questions. **16x5=80**
Each Question carries 16 marks.

2. (a) A toy manufacturing company produces different models of toy. The budget in respect of a model for the month of March, 2019 is as under:

			(₹lakhs)
Budgeted output	**40000 units**		
Variable costs:			
	Materials	**528**	
	Labour	**104**	
	Direct expenses	**248**	**880**
Fixed costs:			
	Specific fixed costs	**180**	
	Allocated fixed costs	**225**	**405**
Total costs			**1285**
***Add:* Profit**			**115**
Sales			**1400**

Required:

(i) Calculate profit with 10% increase in selling price with a 10% reduction in sales volume.

(ii) Determine volume to be achieved to maintain the original profit after a 10% rise in material costs, at the originally budgeted selling price per unit.

(b) SRM Ltd. manufactures and sells a single product X whose selling price is ₹ 80 per unit and the variable cost is ₹ 32 per unit.

(i) Assume that for first year fixed costs are ₹ 9,60,000 and the annual sales are at 60% margin of safety.

(ii) For second year, it is proposed to add another product line Y whose selling price would be ₹ 100 per unit and the variable cost ₹ 20 per unit. The total fixed costs are estimated at ₹ 13,33,200. The sales mix of X : Y would be 7 : 3 based on value.

Required:

(I) For the first year, calculate the rate of net return on sales, assuming an income tax level of 30%.

(II) For second year, at what level of sales would SRM Ltd. break even? Give separately for both X and Y the break even sales in rupees and quantities.

(4+2)+(5+5)=16

Answer:

2. (a)

(i)	Present selling price	₹ 14001akhs/40,000 units	3500
	Add: 10% Increase		350
	Revised selling price		₹ 3850
	Present sales volume		40,000 units
	Less: 10% Decrease		4000
	Revised sales volume		36,000 units

Revised sales revenue = 36,000 × ₹3,850 = ₹1386 lakhs

Total variable cost/unit: Material + Labour + Direct expense

1320 + 260 + 620 = ₹2200

Profitability statement:

Sales	1386
Less: Variable costs (36000 units × ₹2,200)	792
Contribution	594
Less: Fixed costs	405
Profit	₹ 189 lakhs

(ii) Total variable cost/unit: Material + Labour + Direct expense

1452 + 260 + 620 = ₹2,332

Calculation of sales to be achieved to maintain the original profit of ₹115 lakhs:

Selling price	3500
Less: Variable costs	2332
Contribution per unit	1168

Desired sales = (Fixed cost + Desired profit)/Contribution p.u.

= (405 lakhs +115 lakhs)/1168 p.u = 44,521 units

2. (b)

(i) Contribution per unit = SP-VC = ₹(80 - 32) = ₹48

Break-even Point = 960000/48 = 20,000 units

Percentage Margin of Safety = (Actual Sales – Break-even Sales)/Actual Sales

Or, 60%

= (Actual Sales – 20,000 units)/Actual Sales

Actual Sales = 50,000 units

	₹
Sales value (50,000 units x ₹80)	40,00,000
Less: Variable costs (50,000 units x ₹32)	16,00,000
Contribution	24,00,000
Less: Fixed cost	9,60,000
Profit	14,40,000
Less: Income Tax @30%	4,32,000
Net Return	10,08,000

Rate of net return on sales = (10,08,000/40,00,000) × 100 = 25.2%

(ii) Products

	X (₹)	Y (₹)
Selling price per unit	80	100
Variable cost per unit	32	20
Contribution per unit	48	80 -
Individual products contribution margin	60% (48/80) × 100	80% (80/100) × 100

Contribution margin (X and Y)

60% × 7/10 + 80% × 3/10 = 66%

Break even sales = ₹20,20,000 (₹13,33,200/66%)

Break even sales mix

X - 70% of 20,20,000 = ₹14,14,000 i.e. 17,675 units

Y - 30% of 20,20,000 = ₹6,06,000 i.e. 6,060 units

3. (a) Vikas Associates a firm of Chartered Accountants offers three different types of services, namely, accounting and auditing, taxation and management consultancy. Each service is charged on the basis of number of billable hours. The average charge per billable hours is ₹500. For the year ending 31.03.2019 the firm projects the following estimate of direct and indirect costs:

		₹ (Lakhs)		
Direct Costs:	**Accounting and Auditing**	**100.00**		
	Taxation	**100.00**		
	Management consultancy	**50.00**		**250.00**
Indirect Costs:	**Planning and review**	**7.50**		
	Computer processing	**7.20**		
	Professional salaries	**5.60**		
	Books, Seminars, periodicals	**1.80**		
	Programming costs	**8.00**		
	Building costs	**4.90**		
	General administration costs	**15.00**		**50.00**
	TOTAL			**300.00**

Until 31.03.2018 the firm has been allocating the indirect costs on the basis of billable hours. For the year ending 31.03.2019 it was decided to introduce a system of activity based costing to capture the indirect cost more accurately. The following data were gathered accordingly:

Particulars	*Accounting and Auditing*	*Taxation*	*Management Consultancy*
Billable hours	**55000**	**35000**	**10000**
EDP hours	**5000**	**2500**	**500**
Professionals (No)	**30**	**16**	**10**
Books, Seminars and periodicals (₹)	**57,500**	**62,500**	**60,000**
Programming hours	**1250**	**500**	**2250**
Building (Sqft) space occupied	**8000**	**4000**	**2000**
Administration (No. of clients)	**150**	**250**	**100**

Required:

(i) Prepare a comparative profitability statement on the basis of (A) conventional costing and (B) activity- based costing (ABC)

(ii) Any suggestion for improving the billable charge on the basis of ABC?

(b) AB Ltd. produces a variety of products, each having a number of component parts. Product X takes 5 hours to produce on machine no. 55 which is working at full capacity. X has a selling price of ₹ 50 and a marginal cost of ₹ 30 per unit. Y-5, a component part, could be made on the same machine in 2 hours for a marginal cost of ₹ 5 per unit. The supplier's price is ₹ 13-50 per unit.

Required:

Should AB Ltd., make or buy Y-5? (4+4)+(3+1)+4=16

Answer:

3. (a)

SCHEDULE OF ALLOCATION OF INDIRECT COST BY ABC

₹ In lakhs

	Cost Driver		Accounting &		Management consulting
Overhead	Ratio	Total	Auditing	Taxation	
		₹	₹	₹	₹
Planning and Review	Billable Hrs	7.500	4.125	2.625	0.750
Computer Processing	EDP Hour	7.200	4.500	2.250	0.450
Professional Salaries	30:16:10	5.600	3.000	1.600	1.000
Books, Seminar, Periodicals	Actual	1.800	0.575	0.625	0.600
Programmed Costs	5:2:9	8.000	2.500	1.000	4.500
Building Costs	Sq Ft	4.900	2.800	1.400	0.700
Administration Cost	3:5:2	15.000	4.500	7.500	3.000
Total		50	22	17	11

COMPARATIVE PROFITABILITY STATEMENT (₹ in Lakhs)

	Conventional		ABC			
	A&A	Tax	MGMT	A&A	Tax	MGMT
Revenue	275.00	175.00	50.00	275.00	175.00	50.00
Direct Costs	100.00	100.00	50.00	100.00	100.00	50.00

Overhead Cost	27.50	17.50	5.00	22.00	17.00	11.00
Profit	147.50	57.50	-5.00	153.00	58.00	-11.00

Suggestions:

On the basis of the ABC system the total cost of each division/service is ₹122 Lakhs, ₹ 117 Lakhs and ₹61 Lakhs respectively. Hence the billable charge should be revised accordingly. Assuming the same margin i.e. 40% of revenue overall or $66^2/_3$% on cost the revenue works out to

	A&A	Tax	Mgmt
Cost	122.00	117.00	61.00
Margin	81.33	78.00	40.67
	203.33	195.00	101.67
Billable Hours	55,000	35,000	10,000
Charge per Hour	370	560	1017

The analysis clearly reveals that Management Accountancy services are under charged

(b)

Selling Price of product X	₹ 50
Marginal cost	30
Contribution per unit	20

Contribution per machine hr. = ₹ 20 ÷ 5 = ₹ 4

For Component Y-5:	₹	
Marginal cost	5	per unit
Opportunity cost :₹ 4×2 =	8	
Total (to make)	13	

Supplier's price ₹ 13.50

So, AB Ltd. should make Y-5 for gain of (₹ 13.50 – 13.00)

= Re 0.50 per unit.

4. (a) A company produces three products A, B and C, from a joint process. Costs and other details are given below:

	Joint Costs (₹)	*Post-separation Costs*		
Costs:		**A** (₹)	**B** (₹)	**C** (₹)
Materials	**20,000**	**1,500**	**3,500**	**2,000**
Labour	**8,000**	**1,000**	**1,000**	**1,500**
Overhead	**4,000**	**500**	**1,000**	**500**
	32,000	**3,000**	**5,500**	**4,000**

Others:

Sales value (₹)	**10,000**	**25,000**	**15,000**
S & D Exp. (as % of sales)	**20%**	**20%**	**20%**
Estimated Net Profit (as % of sales)	**20%**	**10%**	**20%**

Required:

Prepare a statement showing the apportionment of joint costs over three products using Net Value Method.

(b) Fifteen workers (10 Type I workers and 5 Type II workers) work in a production process during a month of 25 working days. Each Type I worker is expected to produce 8 units per day and Type II worker is expected to produce 12 units per day. They work on the regular shift from 9:00 a.m. to 5 p.m. and have a tea break between 10:30 to 10:45 a.m. and 3:00 to 3:15 p.m. and also have a lunch break from 1:00 to 1:30 p.m. The actual production was 1800 units by Type I workers and 1200 units by Type II workers. The standard wage rate per hour were ₹50 and ₹60 for Type I and Type II workers, respectively and corresponding actuals were 60 and 70, respectively. During the month, 16 hours were lost actually for both types of workers, which is also as per expectation for waiting for materials and inspection.

Required:

Calculate the following:

(i) Standard labour cost for the month

(ii) Labour cost variance

(iii) Labour efficiency variance

(iv) Idle time variance

Indicate (A) or (F) to denote whether the variances are adverse or favourable.

8+(3+3+1+1)=16

Answer:

4. (a)

Statement of Allocation of Joint Costs

	A	B	C	Total
Sales (₹)	10,000	25,000	15,000	50,000
Less:				
Estimated NP	2,000	2,500	3,000	7,500
S & D Cost (20%)₹	2,000	5,000	3,000	10,000
Post-separation cost (₹)	3,000	5,500	4,000	12,500
Total	7,000	13,000	10,000	30,000
Net Value (i.e. basis of allocation)	3,000	12,000	5,000	20,000
Share of joint costs (₹)	4,800	19,200	8,000	30,000
	$\left(\frac{3}{20}\times 32,000\right)$	$\left(\frac{12}{20}\times 32,000\right)$	$\left(\frac{5}{20}\times 32,000\right)$	

4. (b)

	Type I	Type II	Total
Available/m (hrs)	10 workers x 25 days/m x 8 hrs/day (bet 9 to 5) = 2000hrs	5 workers x 25 days/m x 8hrs/day = 1000hrs	
Units per day per worker	8	12	
Hours/unit	8/8 = 1 hr/u	8 hrs/12 units = 2/3 = 0.67 hrs/unit	
Actual production (u)	1800	1200	
Std hrs for actual production	1800 x 1 = 1800	1200x2/3 = 800	
Standard rate/hr	50	60	
Std cost of	1800x50 = 90,000	800 x 60 =48,000	138,000

production			
Actual hours paid	2000 hours	1000hrs	
Actual rate	60	70	
Actual cost	120,000	70,000	190,000
Labour cost variance			52,000 (A)
Efficiency variance	(1800-2000)x50 = 10,000(A)	(800-1000)x60 = 12000(A)	22,000(A)
Idle time variance (Since normal waiting and break are included in standard labour hours)	Nil	Nil	

(Standard production hours per day = 8 (normal breaks and waiting time have to be include in the standard)

No. of days per month = 25.

Standard hours per month = 25 x 8 = 200 hours per worker x 10 workers = 2000 hours.)

5. (a) X Ltd. manufactures and sells a special component. It follows a Standard Marginal Costing system. For the year ended 31.03.2019, it produced 1500 components against a budgeted capacity of 2000 components. Out of the production 100 components were scrapped. Due to a computer virus most of the financials could not be retrieved.

However, the Chief Cost Accountant gave the following information:

Particulars	**(₹)**
Selling Price per component	**213**
Direct materials total cost	**84,000**
Direct labour cost per component (Actual efficiency 80%)	**?**
Variable Manufacturing overhead per component	**15**
Variable Selling overhead per component	**8**
Fixed Selling and Administration overheads	**48,000**
Fixed overhead manufacturing absorption rate per component (on the basis of budgeted capacity)	**30**
Closing stock (200 units) (Valued at prime cost for financial	**18,000**

purpose)	

Required:

(i) Prepare the Profitability statements as per Marginal Costing, Absorption Costing and the actual Profit & Loss Account.

(ii) Reconcile the actual profit with that of the Break-even profit under Marginal Costing.

(b) What do you understand by Learning Curve? What are its different phases? State the possible areas of application of Learning Curve. (6+2)+(2+2+4)=16

Answer:

5. (a) (i)

(1)	Fixed Manufacturing Overheads	=	60,000
	Budgeted Capacity × Absorption Rate (2000×30)		
	Fixed administrative Overheads	=	48,000
	Total Fixed cost	=	108,000

(2)	Contribution per Unit	
	Selling	213
	Price Prime Cost	
	(Material + Labour)(18000/200)	90
	Variable Manufacturing Overhead	15
	Variable Selling Overhead	8
	Contribution/Unit	100

(3)	Break Even volume (108000/100 Units)	=	1,080	Units

(4)	Total Absorption Cost / Unit (60+30+15)	=	105
	(Materials + Labour + Variable Manufacturing OH)		

Profit under Marginal Costing:	
Contribution (1200×100)	= 1,20,000
Less: Fixed Cost	1,08,000
Profit under Marginal Costing	12,000

Particulars	Profit under Absorption Costing	Actual P&L A/c
Sales (1200 Units × ₹213)	255,600	255,600
Cost of Goods Manufactured		
Production (1500 Units × ₹105)	202,500	202,,500
Additional Labour cost	-	12,750
Less: Closing Stock(200 units x 135 p.u.) (18000 given in the question)	27,000	18,000
Less: Scrap 100 units x 135	13500	
Add: Under absorption of OH (500×30)	15,000	15,000
Add: Manufacturing Fixed OH	-	-
Total Cost of Manufacture	177,000	2,12,250
Gross Profit	78,600	43,350
Less: Fixed Administrative OH	48,000	48,000
Less: Variable Selling OH	9,600	9,600
Profit/(Loss)	21,000	(14,250)

(ii)

Reconciliation (actual P& L with Marginal Costing)

Profit at Break Even point 0

Margin of Safety +12,000

Stock Valuation -3000

(at variable cost under marginal costing 105 x 200 = 21000 and at 90 as per actual P and L given= 18000)

Less: Scrap (variable mfg cost 105 x 100) = -10,500

Less: Labour - 12,750

Actual Loss -14,250

5. (b)

Learning Curve Theory is concerned with the idea that when a new job, process or activity commences for the first time it is likely that the workforce involved will not achieve maximum efficiency immediately. Repetition of the task is likely to make the people more confident and knowledgeable and will eventually result in a more efficient and rapid operation. Gradually

the learning process will stop after continually repeating the job. As a consequence the time to complete a task will initially decline and then stabilise once efficient working is achieved.

Cost predictions especially those relating to direct labour cost must allow for the effect of learning process. This technique is a mathematical technique. It can be very much used to accurately and graphically predict cost. It is a geometrical progression, which reveals that there is steadily decreasing cost for the accomplishment of a given repetitive operation, as the identical operation is increasingly repeated. The amount of decrease is less and less with each successive unit produced.

The cumulative average time per unit is assumed to decrease by a constant percentage every time that output doubles. Cumulative average time refers to the average time per unit for all units produced so far, from and including the first one made.

The slope of the decision curve can be expressed as a percentage. Experience curve, improvement curve and progress curve are other terms which can be synonymously used. Learning curve is essentially a measure of the experience gained in production of an article by an individual or organization. The improvement or experience gain is reflected in a decrease in man-hours or cost.

Phases in Learning Curve

The learning curve will pass through three different phases:

In the first phase, there will be gradual increase in production rate until the maximum expected rate is reached and this phase is generally steep.

In the second phase, the learning rate will gradually deteriorate because of the limitations of equipment.

In the third phase, the production rate begins to decrease due to a reduction in customer requirements and increase in costs.

Learning curve is essentially a measure if the experience gained in production of an article by an organization. As more and more units re-produced, workers involved in production become more efficient than before.

The learning curve ratio can be calculated with the help of the following formula:

Learning curve ratio = Average labour cost of first 2 units /Average labour cost of first units

Following are the **possible areas of application of Learning Curve:**

1. Learning curve suggests great opportunities for cost reduction to be achieved by improving learning.
2. The learning curve concept suggests a basis for correct staffing in continuously expanding production. The curve shows that the work force need not be increased at the same rate as the prospective output.
3. Learning curve concept provides a means of evaluating the effectiveness of training programs.
4. Learning curve is frequently used in conjunction with establishing bid price for contracts.

5. Learning curve is applicable in relation to the working capital required. If the requirement is based on average cumulative unit cost, the revenues from the first few units may not cover the actual expenditures.
6. It affects the rate of production by increasing.
7. Learning curve techniques are useful in exercising control. Specific or average incremental unit cost should be used for this purpose.
8. The learning curve may be used for make-or- buy decisions especially if the outside manufacturer has reached the maximum on the learning curve.

6. (a) AB Ltd. has two manufacturing divisions, A and B, operating as profit centres. A has a production capacity of 3500 units of product A per month, but presently, it produces 2000 units for a special customer S, @ a selling price of ₹ 400 per unit (which will not accept partial supply) and 1000 units for B. S has an agreement with AB that A shall not supply to the external market at any price lower than that to S, or it can supply to the market at any price after discontinuing supplies to S. Division B does some further work on A, incurs a variable processing cost of ₹220 per unit to produce its product B. The monthly fixed costs of Division A are ₹ 2,00,000. The monthly fixed costs of B are₹ 1,50,000. Division A's raw material cost is ₹150 per unit and its variable manufacturing costs are ₹ 100 per unit. Variable selling overhead of ₹ 50 per unit of A and ₹ 70 per unit of B are incurred for sales other than transfers.

A had been selling to the outside market at a price of ₹460 per unit. Due to competition, it has to reduce its price to ₹380 per unit on the entire supplies if it has to sell any quantity above 2000 units. At ₹380/unit, its entire output can be sold. B has an outside market price of ₹ 800 per unit and can sell up to 2500 units. If A does not supply to B, a close substitute is available in the market for purchase by B at ₹ 380, on which some additional work costing ₹ 40 per unit has to be done to make it comparable to A. Assume that B will accept partial supply from A and that both divisions have complete autonomy in deciding their strategy and they have the knowledge of costs/revenues/supply conditions in each other's divisions.

Required:

Using figures relevant for the following questions and calculations for the monthly period:

(i) Find out the optimal strategy for A - how much to produce each month, how much to supply to external market and how much to supply to B and at what minimum cost to maximize its Divisional profits.

(ii) What would be the range of transfer price per unit and the quantity that Manager of A will try to successfully negotiate with the Manager of B?

(iii) What would be the range of transfer price that the Manager of B would consider to negotiate with A?

(iv) As the top management person, what would you quote as the appropriate transfer price to be fair to A and B in their performance evaluation?

(b) Briefly state the significance of Margin of Safety in management decisions.

(4+4+2+2)+4=16

Answer:

6. (a)

Strategy for A:

Strategy I:

Sell 2000 units to S at 400 ₹/u and 1500 units outside @ 460 ₹/u

Contributions: 100x2000	=	200,000
Contribution (outside) 160 x 1500	=	240,000
Total Contribution for 3500 units		440,000
Less: Fixed Cost	=	200,000
Profit		240,000

Strategy II:

Sell 1500 units to B at 380/unit and 2000 units outside at 460/u

Contribution B: 380-250 excluding selling cost = 130x1500	=	195,000
Contribution outside = 160 x 2000	=	320,000
Total Contribution	=	515,000
Less: Fixed Cost	=	200,000
Profit		315,000

Selling all 3500 units only to B or only outside are less profitable than the above two options and are rejected. Select Strategy II for A.

B can get an equivalent product outside at ₹ 380, but has to incur additional costs up to ₹420. A can negotiate anything between 380 and₹ 420

The Manager of B knows that A will save on the external sales' variable selling overhead. What is Rs. 380 for A from outside selling price (380-300 = 80) is equivalent of Rs. 330 from B (contribution = 330-250 = 80).

Manager of B will negotiate between ₹330 per unit to ₹420 per unit, beyond which B will not pay.

Top Management:

At 380 transfer price, A saves Rs. 50 on selling overhead. B saves Rs. 40 on reworking. Hence, at 375, A saves Rs. 45 and B also saves Rs. 45. Hence Rs. 375 will be a fair cost.

Alternatively,

As top management, the price to be decided will be midway between 380 and 420, which is 400,equally fair to A and B.

(b)

Significance of Margin of Safety in Management Decisions:

Margin of Safety (MOS) is the excess sales over and above the break-even sales. It is generally expressed in % form. The size of margin of safety is a very important indicator of the soundness of a business. It shows how much sales may decrease before the firms will suffer a loss. If the size of margin of safety is high, chances of incurring loss by the business will be remote but if it is low, a small reduction in sales may lead to loss. The common cause of lower margin of safety is higher fixed costs. In such a business, a high level of activity is required. A low margin of safety is a matter of concern and so the following steps may be taken to improve an unsatisfactory margin of safety:

1. Increase the selling price.
2. Reduce the fixed or variable costs or the both.
3. Increase the volume of output by utilizing the unutilized production capacity.
4. Stop production of unprofitable products and concentrate only on the profitable products.

7. (a) In the manufacturing plant of Delite Industries Ltd., four jobs can be processed on four different machines, one job on one machine. Resulting profits vary with assignments. They are given below:

Machines					
Jobs	I	42	35	28	21
	n	30	25	20	15
	m	30	25	20	15
	IV	24	20	16	12

Required:

Find the optimum assignment of jobs to machines and the corresponding profit.

(b) The following information are given:

Arrival of patients		Services	
Inter-arrival time (minutes)	Probability	Inter-Service time (minutes)	Probability
2	0-20	4	0-25
4	0-24	6	0-34

6	**0-28**	**8**	**0-26**
8	**0-18**	**10**	**Balance**
10	**Balance**		

The following random number are to be used for the simulation of arrival and service patterns:

Arrival	**740**	**225**	**906**	**048**	**421**
Service	**402**	**183**	**706**	**923**	**638**

Required:

(i) Find out the average time spent by the patient in the queue by simulation. Assume that the time starts at 6:00 a.m. and that there is only one counter and there is no time gap between finishing with one patient and starting the next patient if the next patient is already in the queue.

(ii) A second counter is to be set up if the probability of waiting beyond 3 minutes exceeds 40% or if the average waiting time of a patient exceeds 5 minutes if there is a wait. Should the second counter be set up? Substantiate based on the simulation results. 8+(6+2)=16

Answer:

7. (a)

Profit Matrix

0	7	14	21
12	17	22	27
12	17	22	27
18	22	26	30

Row Operation

0	7	14	21
0	5	10	15
0	5	10	15
0	4	8	12

Column Operation

0	3	6	9
0	1	2	3
0	1	2	3
0	0	0	0

Improved Matrix

0	2	5	8
0	0	1	2
0	0	1	2
1	0	0	0

Further Improvement

0	2	4	7
0	0	0	1
0	0	0	1
2	1	0	0

I	-	1	-	42
II	-	2	-	25
III	-	3	-	20
IV	-	4	-	12
				99

Maximum Profit = ₹ 99

7. (b)

Arrivals				Service			
Minutes	Probability	Cumulative Probability	Random No. Interval	Minutes	Probability	Cumulative Probability	Random No. Interval
2	0.20	0.20	000-199	4	0.25	0.25	000-249
4	0.24	0.44	200-439	6	0.34	0.59	250-589

6	0.28	0.72	440-719	8	0.26	0.85	590-849
8	0.18	0.90	720-899	10	0.15	1.00	850-999
10	0.10	1.00	900-999				

Sl. No	Random No. Arrival	Time	Entry time In queue	Service Start time	Random No For Service	Service Time	Service End Time	Waiting Time Of Patient	Idle Time Of Centre
1	740	8	6:08	6:08	402	6	6:14	-	08
2	225	4	6:12	6:14	183	4	6:18	2	-
3	906	10	6:22	6:22	706	8	6:30	-	4
4	048	2	6:24	6:30	923	10	6:40	06	-
5	421	4	6:28	6:40	638	8	6:48	12	

Probability of waiting time being more than 3 minutes = 2/5 = 40%

Hence is not exceeding 40%.

Average waiting time of a patient = Total of waiting time column / 3 instances of waiting

= 20/3 = 6.67

Hence the second counter should be set up based on simulated results.

Note: Ideally, for best results and interpretation, simulation should be carried out a large number of times. The decision based on small numbers, tend to be unrealistic and erroneous.

8. Write short notes on *any four* of the following: 4×4=16

(a) Principal Budget Factor

(b) Lean Accounting

(c) Differential Costs

(d) Product Life Cycle Costing

(e) Activity Ratio

Answer:

(a) Principal Budget Factor

The principal budget factor is the factor that limits the activities of functional budgets of the organisation.

The early identification of this factor is important in the budgetary planning process because it indicates which budget should be prepared first. In general sales volume is the principal budget factor. So, sales budget must be prepared first, based on the available sales forecasts. All other budgets should then be linked to this.

Failure to identify the principal budget factor at an early stage could lead to delays later on when managers realize that the targets they have been working with are not feasible.

In case of one limiting factor, we shall need to apply the concept of Marginal costing. In this we initially allot the limiting resource on the basis of highest contribution per limiting factor.

Principal Budget Factor is important concept in the process of budgetary control. This is the factor the extent of whose influence must first assessed in order to ensure that the functional budgets are reasonably capable of fulfillment. A budget key factor or principal budget factor is described as - The factor which at a particular time or over a period which limit the activities of an undertaking.

The limiting factor is usually the level of demand for the products or services of the undertaking but it could be a shortage of one of the productive resources, e.g., skilled labour, raw material or machine capacity. In order to ensure that the functional budgets are reasonably capable of fulfillment the extent of the influence of this factor must first be assessed.

(b) Lean Accounting

What we now call lean manufacturing was developed by Toyota and other Japanese companies. Toyota executives claim that the famed Toyota Production System was inspired by what they learned during visits to the Ford Motor Company in the 1920s and developed by Toyota leaders such as Taiichi Ohno and consultant Shigeo Shingo after World War II. As pioneer American and European companies embraced lean manufacturing methods in the late 1980s, they discovered that lean thinking must be applied to every aspect of the company including the financial and management accounting processes.

Lean Accounting is the general term used for the changes required to a company's accounting, control, measurement, and management processes to support lean manufacturing and lean thinking. Most companies embarking on lean manufacturing soon find that their accounting processes and management methods are at odds with the lean changes they are making. The reason for this is that traditional accounting and management methods were designed to support traditional manufacturing; they are based upon mass production thinking. Lean manufacturing breaks the rules of mass production, and so the traditional accounting and management methods are (at best) unsuitable and usually actively hostile to the lean changes the company is making.

(c) Differential Accounting

The essential features of differential costs are as follows:-

(i) The basis data used for differential cost analysis are costs, revenue and the investment factors which are relevant in the problem for which the analysis is undertaken.
(ii) Total differential costs rat her than the costs per unit are considered.
(iii) Differential cost analysis is made outside the accounting records.
(iv) As the differences in the costs at two levels are considered, absolute costs at each level are not as relevant as the difference between the two. Thus, items of costs which do not change but are identical for the alternatives under consideration, are ignored.
(v) The differentials are measured from a common base point or position.
(vi) The stage at which the difference between the revenue and the cost is the highest, measured from the common base point, determines the choice from amongst a number of alternative actions.
(vii) In computing differential costs, historical or standard costs may be used but they should be adjusted to the requirements of future conditions.
(viii) The elements and items of cost to be considered in differential cost analysis will depend upon the nature of the problem and the alternatives being considered.

(d) **Product Life Cycle Costing** is considered important due to the following reasons

(i) **Time based analysis:** Life cycle costing involves tracing of costs and revenues of each product over several calendar periods throughout their life cycle. Costs and revenues can analysed by time periods. The total magnitude of costs for each individual product can be reported and compared with product revenues generated in various time periods.

(ii) **Overall Cost Analysis:** Production Costs are accounted and recognized by the routine accounting system. However non-production costs like R&D; design; marketing; distribution; customer service etc. are less visible on a product — by — product basis. Product Life Cycle Costing focuses on recognizing both production and non-production costs.

(iii) **Pre-production costs analysis:** The development period of R&D and design is long and costly. A high percentage of total product costs may be incurred before commercial production begin. Hence; the Company needs accurate information on such costs for deciding whether to continue with the R&D or not.

(iv) **Pre-production costs analysis:** The development period of R&D and design is long and costly. A high percentage of total product costs may be incurred before commercial production begin. Hence; the Company needs accurate information on such costs for deciding whether to continue with the R&D or not.

(v) **Better Decision Making:** Based on a more accurate and realistic assessment of revenues and costs, at least within a particular life cycle stage, better decisions can be taken.

(vi) **Long Run Holistic view:** Product Life Cycle Costing can promote long-term rewarding in contrast to short-term profitability rewarding. It provides an overall framework for considering total incremental costs over the entire life span of a product, which in

turn facilitates analysis of parts of the whole where cost effectiveness might be improved.

(vii) **Life Cycle Budgeting:** Life Cycle Budgeting, i.e., Life Cycle Costing with Target Costing principles, facilitates scope for cost reduction at the design stage itself. Since costs are avoided before they are committed or locked in the Company is benefited.

(viii) **Review:** Life Cycle Costing provides scope for analysis of long term picture of product line profitability, feedback on the effectiveness of life cycle planning and cost data to clarify the economic impact of alternatives chosen in the design, engineering phase etc.

(d) Activity Ratio

It is the number of standard hours equivalent to the work produced, expressed as a percentage of the budgeted standard hours.

$$\text{Activity Ratio} = \frac{\text{Standard Hours for Actual Work}}{\text{Budgeted Standard hours}} \times 100$$

Activity ratios gauge an organization's operational efficiency and profitability. These rations are most useful when compared to a competitor or industry to establish whether an entity's processes are favourable or unfavourable. Activity ratios can form a basis of comparison across multiple reporting periods to determine changes over time.