

Sreeram Coaching Point, Chennai Bangalore and Ernakulam
Cost Management – Suggested Answer CA Final Nov. 2008

Roll No.....

Total No. of Questions—6]

[Total No. of Printed Pages—8

Time Allowed—3 Hours

Maximum Marks—100

DLF

Answers to questions are to be given only in English except in the case of candidates who have opted for Hindi medium. If a candidate who has not opted for Hindi medium, answers in Hindi, his answers in Hindi will not be valued.

Question No. 1 is compulsory. Answer any **four** questions from the rest.

Working notes should form part of the answer.

Marks

1. (a) State the general guidelines to be used in adopting a pricing policy in a manufacturing organization. 3
- (b) A company which has developed a new machine has observed that the time taken to manufacture the first machine is 600 hours. Calculate the time which the company will take to manufacture the second machine if the actual learning curve rate is (i) 80% and (ii) 90%. Explain which of the two learning rates will show faster learning. 3
- (c) A company manufactures three types of products namely P, Q and R. The data relating to a period are as under : 7

	P	Q	R
Machine hours per unit	10	18	14
Direct labour hours per unit @ Rs. 20	4	12	8
Direct Material per unit Rs.	90	80	120
Production (units)	3,000	5,000	20,000

Currently the company uses traditional costing method and absorbs all production overheads on the basis of machine hours. The machine hour rate of overheads is Rs. 6 per hour.

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Cost Management – Suggested Answer CA Final Nov. 2008

The company proposes to use activity based costing system and the activity analysis is as under :

	P	Q	R
Batch size (units)	150	500	1,000
Number of purchase orders per batch	3	10	8
Number of inspections per batch	5	4	3

The total production overheads are analysed as under :

Machine set up costs	20%
Machine operation costs	30%
Inspection costs	40%
Material procurement related costs	10%

Required :

- (i) ~~Calculate the cost per unit~~ of each product using traditional method of absorbing all production overheads on the basis of machine hours.
- (ii) Calculate the cost per unit of each product using activity based costing principles.
- (d) A single product manufacturing company has an installed capacity of 3,00,000 units per annum. The normal capacity utilization of the company is 90%. The company has prepared the following budget for a year : 11

Variable costs :

Factory costs	Rs. 33 per unit
Selling and Administration costs	Rs. 9 per unit

Fixed costs :

Factory costs	Rs. 21,60,000
Selling and Administration costs	Rs. 7,56,000

Selling Price

Selling price per unit	Rs. 60
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Cost Management – Suggested Answer CA Final Nov. 2008

The actual production, sales, price and cost data relating to the year under review are as given below :

Production	2,40,000 units
Sales	2,25,000 units
Finished goods stock in the beginning of the year :	15,000 units
Actual factory variable costs exceeded the budget by	Rs. 1,20,000

Required :

- (i) Calculate the budgeted profit and break-even point in units.
- (ii) What increase in selling price was necessary during the year under review to maintain the budgeted profit ?
- (iii) Prepare statements showing the actual profit during the year under review by using (1) absorption costing method and (2) marginal costing method.

Solution to Question 1 (a) General guidelines to be adopted for the choice of pricing policy

1. The longevity of the product.
2. Competition in the market
3. Return on capital employed of the firm
4. Elasticity of demand
5. Cross-elasticity of other products of the firm
6. Recovery of cost.

Solution to Question 1 (b)

Units	80%		90%	
	CATPU	Total Time	CATPU	Total Time
1	600	600	600	600
2	480	960	540	1080
	(80% 600)	(2 x 480)		(2 x 540)
Time for the 2 nd Unit		360		480
		(960 – 600)		(1080 – 600)
80% learning curve rate shows faster learning on account of lesser amount of time involved for the 2nd unit.				

Solution to Question 1 (c)

(i) Traditional Method

	Rs, Cost per Unit		
	P	Q	R
Direct Method	90	80	120
Direct Labour	80	240	160
Overhead @ Rs. 6/Hr on Machine Hour	60	108	84
	(10 x 6)	(18 x 6)	(14 x 6)
	230	428	364

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Cost Management – Suggested Answer CA Final Nov. 2008

Workings under ABC						
Product	No. of Units	M Hrs/Unit	M Hrs	Batches	Inspection	Purchase Order
P	3000	10	30000	20 (3000/150)	100 (20 x 5)	60 (20 x 3)
Q	5000	18	90000	10 (5000/500)	40 (10 x 4)	100 (10 x 10)
R	20000	14	280000	20 (20000/1000)	60 (20 x 3)	160 (20 x 8)
			400000	50	200	320
Overhead @ Rs. 6/Hr = 4L x 6 → Rs. 24L						

[Rs. In 000's]

(ii) Activities	%	Cost Pool	C Driver	CDQ	CDQ Rate(Rs.)
MC Setup	20	480	Batches	50 Batches	9600
M _c Operation	30	720	M Hrs	4L	1.80
Inspection	40	960	Inspection	200	4800
Mat	10	240	Purchase Order	320	750
	100	2400			

(iii) Link of overheads						
Product	Set up cost	Machine Operation Cost	Inspection Cost	Purchase Order Cost	Total	Rate
P	192000 (20 x 9600)	54000 [30000x1.8]	480000 [100x4800]	45000 [60x750]	771000	257
Q	96000 [10x9600]	162000 [90000x1.8]	192000 [40x4800]	75000 [100x750]	525000	105
R	192000 [20x9600]	504000 [280000x1.8]	288000 [60x4800]	120000 [160x750]	1104000	55.2

Cost sheet under ABC

	P	Q	R
Direct Material	90	80	120.00
Direct Labour	80	240	160.00
Overhead	257	105	55.20
	427	425	335.20

Solution to Question 1 (d) (i)

	Budget
SP	60
VC	
Factory Cost	33
Selling distribution	9
	42
Contribution	18

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Cost Management – Suggested Answer CA Final Nov. 2008

Units		270000
Contribution		4860000
Fixed cost		
Factory cost	2160000	
S & D	756000	2916000
Budgeted Profit		1944000
Break even point		162000 Units

$$= \frac{\text{Fixed Cost}}{\text{Cn./Unit}} = \frac{2916000}{18}$$

Solution to Question 1 (d) (ii)

(ii)	Budgeted Profit	1944000
	Fixed Cost	2916000
		4860000

Opening Stock		
Variable cost	630000	
240000 x 42	10080000	
Increase	120000	
	10200000	
Less Closing Stock	1275000	9555000

$$[4860000 + 9555000] = 14415000$$

$$\text{No. of Units sold) } = 225000$$

$$\begin{aligned} \text{Existing price} &= 60.00 \\ \text{Increase in price} &= 4.07 \end{aligned}$$

Alternatively

Budgeted Profit		1944000
Fixed Cost		2916000
Budgeted Contribution		4860000
Variable S & A cost		
9 x 225000 =	2025000	
Variable Factory Cost		
Opening Stock 33 x 15000 =	495000	
Current year Production used in sales 33 x 210000	6930000	
Increase in cost on pro rata basis 120000/240000 x 210000 =	105000	9555000
Sales [Budgeted contribution + Variable Cost]		14415000
Units		225000
Selling Price		64.07
Budgeted selling price		60.00
Increase in SP		4.07

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Cost Management – Suggested Answer CA Final Nov. 2008

(iii)

Absorption costing system		Rs. '000
Opening Stock 15000 x (33 + 8)		615
Current year Production cost 240000 x 33.50 (Including Hike)	8040	
Fixed Cost	2160	
	10200	
Less: Closing Stock 10200000/240000 x 30000	1275	8925
		9540
Variable S & A 225000 x 9	2025	
Fixed S & A	756	2781
		12321
Sales		13500
Profit		1179

Marginal Costing System		Rs. '000
Factory Variable Cost		
(240000 x 33) + 120000		8040
Opening stock		
15000 x 33		495
		8535
Less: Closing stock (30000 x 33) + [(120000/240000) x 30000]		1005
		7530
Variable selling and Administration cost		
225000 x 9		2025
		9555
Fixed cost		
F _v overhead	2160	
S & A overhead	756	2916
		12471
Sales		13500
Profit		1029

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Cost Management – Suggested Answer CA Final Nov. 2008

2. (a) Discuss the benefits accruing from the implementation of a Total Quality Management programme in an organisation. 4
- (b) Explain the concept of relevancy of cost by citing three examples each of ~~relevant costs and non-relevant costs.~~ 4
- (c) A manufacturing company has furnished the following financial data relating to the actual output of 9,600 units produced in the last quarter : 11

		Rs.
		4,45,500
Sales		
Costs :		
Direct Materials	59,400	
Direct Wages	89,400	
Variable Overheads	1,45,500	
Fixed Overheads	78,000	3,72,300
Profit		73,200

The standard wage rate is Rs. 4.50 per hour and the standard variable overhead rate is Rs. 7.50 per hour. The company uses a JIT system and the budgeted production and sales quantity is 10,000 units.

The following are the variances from standard costs recorded during the last quarter :

		Rs.
Direct materials	Price V	600 A
	Usage V	1,200 A
Direct Wages	Rate V	1,500 F
	Efficiency V	4,500 A
Variable overheads	Expense V	6,000 F
	Efficiency V	7,500 A
Fixed overheads	Expense V	3,000 A
Sales	Price V	13,500 F

You are required to :

- (i) Prepare the Original budget and Standard cost sheet per unit of output;
- (ii) Produce a statement reconciling the budgeted profit with actual profit.

Solution to Question No. 2 (a)

Benefits accrued in implementing TQM programme

1. Better quality product.
2. Better usage of resources
3. Reduction in cost
4. Increase in profits
5. Better rating in the minds of customers and thereby enhancement of Goodwill
6. Better supplier- customer relationship
7. Greater market share
8. Possibility of innovation

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Cost Management – Suggested Answer CA Final Nov. 2008

Solution to Question No. 2 (c)

Relevant costs are the costs to be considered for decision making and not the historical costs.
Considering only relevant cost is referred to as relevant costing.

Material

Relevant

Current replacement cost is relevant for Materials used regularly. The reason is that, because of usage of such regularly used material, the firm is forced buy additional quantity at current replacement cost.

Irrelevant

The actual cost of the materials used in the project/contract is historical cost is not relevant.

Relevant

Labour recruited exclusively for the contract is relevant.

Irrelevant

Labour paid on time guaranteed basis is irrelevant because in any case they are paid for the time irrespective of where they are engaged or disengaged or idled.

Relevant

Loss of profit elsewhere by taking up a project is a relevant cost for the project taken up. Opportunity cost is opportunity lost.

Irrelevant

Administrative expenses are generally irrelevant as they would not undergo any change irrespective of the presence or otherwise of a contract. They are sunk cost.

Solution to Question No. 2 (c)

- | | | |
|-------|---------------------|----------------------|
| (i) | MPV + MUV | = MCV |
| | 600A + 1200A | = 1800(A) |
| | MCV | = SC – AC |
| | - 1800 | = SC – 89400 |
| | SC | = 57600 |
| | | |
| (ii) | LRV + LEFFV | = LCV |
| | 1500 (F) + 4500(A) | = LCV |
| | LCV | = 3000(A) |
| | - 3000 | = SC – 98400 |
| | SC | = 86400 |
| | | |
| (iii) | VO EXPV + VO EFFIV | = VOCV |
| | 6000 (F) + 7500 (A) | = VOCV |
| | VOCV | = – 1500 |
| | - 1500 | = SC - 145500 |
| | SC | = 144000 |
| | | |
| (iv) | FOEXPV | = BFO – AFO |
| | - 3000 | = BFO – 78000 |
| | BFO | = 75000 |
| | | |
| (v) | SPV | = AQ x BP – AQ x AP |
| | -13500 | = 9600 x BP – 445500 |
| | 43200 | = 9600 x BP |
| | BP | = Rs. 45 |

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Cost Management – Suggested Answer CA Final Nov. 2008**

Units	9600		10000
	Standard	P/Unit	Budget
Direct Material	57600	6	60000
Direct Labour	86400	9	90000
Variable Overhead	144000	15	150000
		30	
Fixed Overhead	75000	NA	75000
	363000		375000
Sales	432000	45	450000
Profit	69000		75000
Contribution Per unit		15	

Reconciliation statement			
Budget Profit			75000
	F	A	
Direct Mat Price		600	
Direct Mat usage		1200	
Direct Labour Rate	1500		
Direct Labour Efficiency		4500	
VOH Exp. Variance	6000		
VOH efficiency variance		7500	
Fixed Overhead Exp		3000	
Selling Price Variance	13500	-	
Sales volume variance x PVR or Cn/unit			
(10000 – 9600) x 15		6000	
	21000	22800	(1800)
Actual Profit			73200

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Cost Management – Suggested Answer CA Final Nov. 2008

3. (a) Describe the four types of bench marking of critical success factors: 4
- (b) Explain, how the implementation of JIT approach to manufacturing can be a major source of competitive advantage. 4
- (c) A project consists of seven activities and the time estimates of the activities are furnished as under : 11

Activity	Optimistic Days	Most likely Days	Pessimistic Days
1-2	4	10	16
1-3	3	6	9
1-4	4	7	16
2-5	5	5	5
3-5	8	11	32
4-6	4	10	16
5-6	2	5	8

Required :

- (i) Draw the network diagram.
- (ii) Identify the critical path and its duration.
- (iii) What is the probability that the project will be completed in 5 days earlier than the critical path duration ?
- (iv) What project duration will provide 95% confidence level of completion ($Z_{0.95} = 1.65$) ?

Given

Z	1.00	1.09	1.18	1.25	1.33
Probability	0.1587	0.1379	0.1190	0.1056	0.0918

Solution to Question No. 3 (a)

Benchmarking is the continuous search for and adaptation of significantly better practices that leads to superior performance by investigating the performance and practices of other organizations' (benchmark partners). In addition, it can create a crisis to facilitate the change process. Four types of bench marking of critical success factors are

- (i) Strategic Benchmarking
- (ii) Functional Benchmarking
- (iii) Best Practices Benchmarking
- (iv) Product Benchmarking

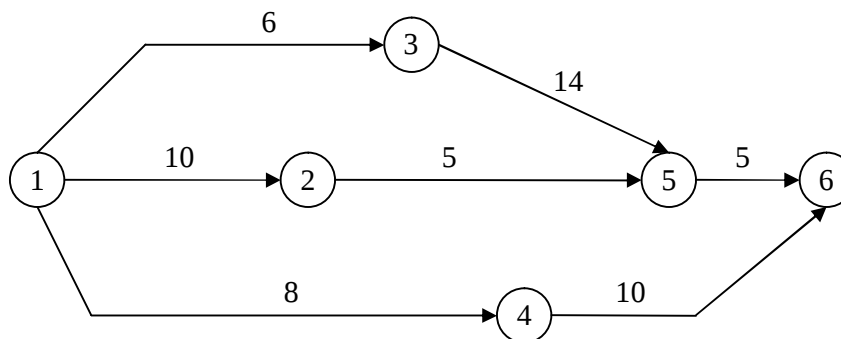
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Cost Management – Suggested Answer CA Final Nov. 2008

Solution to Question No. 3 (b) JIT – a major source of competitive advantage

1. Saving in costs can be passed on to customers by lowering the price.
2. Qualitative product and timely delivery will fetch premium amongst customers
3. Helps to retain the customer for a longer term
4. Better service after sales helps to promote customer relationship

Solution to Question No. 3 (c)

(i) Network diagram



(ii) Activity	t _n	Variance	Critical Path Ascertainment	
1-2	10			
1-3	6	1	1-2-5-6	10+5+5=20
1-4	8		1-3-5-6	6+14+5=25
2-5	5		1-4-6	8+10=18
3-5	14	16	Critical path	25 days
4-6	10		1-3-5 = 6	
5-6	5	1	Standard deviation →	4.24

(iii) Probability of completion by 20 days

a)

$$Z = \frac{x - \bar{x}}{\sigma}$$

$$= \frac{20 - 25}{4.24}$$

$$= -1.18$$

b) NT [1.18] = 0.1190

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Cost Management – Suggested Answer CA Final Nov. 2008

c) Prob $P = 0.5 - 0.1190$
 $= 0.3810$ i.e., 38%

(iv) Duration with 95% probability

a) Prob $= 95\%$
 b) NT (Z) $= 0.45$
 c) 0.45 $= x - 25/4.24$

x is 27 days

4. (a) State the methods in which initial feasible solution can be arrived at in a transportation problem. 3
- (b) State the advantages and limitations of Zero Based Budgeting. 5
- (c) A large business consultancy firm is organized in to several divisions. One of the divisions is the Information Technology (IT) division which provides consultancy services to its clients as well as to the other divisions of the firm. The consultants in the IT divisions always work in a team of three professional consultants on each day of consulting assignment. The external clients are charged a fee at the rate of Rs. 4,500 for each consulting day. The fee represents the cost plus 150% profit mark up. The break up of cost involved in the consultancy fee is estimated at 80% as being variable and the balance is fixed. 11
- The textiles division of the consultancy firm which has undertaken a big assignment requires the services of two teams of IT consultants to work five days in a week for a period of 48 weeks. While the director of the textiles division intends to negotiate the transfer price for the consultancy work, the director of IT division proposes to charge the textiles division at Rs. 4,500 per consulting day.
- In respect of the consulting work of the textiles division, IT division will be able to reduce the variable costs by Rs. 200 per consulting day. This is possible in all cases of internal consultations because of the use of specialized equipment. You are required to explain the implications and set transfer prices per consulting day at which the IT division can provide consultancy services to the textiles division such that the profit of the business consultancy firm as a whole is maximized in each of the following scenarios :
- (i) Every team of the IT division is fully engaged during the 48 week period in providing consultancy services to external clients and that the IT division has no spare capacity of consultancy teams to take up the textiles division assignment.

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Cost Management – Suggested Answer CA Final Nov. 2008

- (ii) IT division will be able to spare only one team of consultants to provide services to the textiles division during the 48 week period and all other teams are fully engaged in providing services to external clients.
- (iii) A new external client has come forward to pay IT division a total fee of Rs. 15,84,000 for engaging the services of two teams of consultants during the aforesaid period of 48 weeks.

Solution to Question No. 4 (a)

The methods through which initial basic feasible solution drawn in transportation are

- (i) North West Corner Rule method
- (ii) Least Cost entry method
- (iii) Vogel's Approximation method

Solution to Question No. 4 (b)

Advantages of zero-base budgeting: The advantages of zero-base budgeting are as follows:

1. It provides a systematic approach for the evaluation of different activities and rank them in order of preference for the allocation of scarce resources
2. It ensures that the various functions undertaken by the organization are critical for the achievement of its objectives and are being performed in the best possible way
3. It provides an opportunity to the management to allocate resources for various activities only after having a thorough cost-benefit analysis. The chances of arbitrary cuts and enhancement are thus avoided
4. The areas of wasteful expenditure can be easily identified and eliminated
5. Departmental budgets are closely linked with corporate objectives
6. The technique can also be used for the introduction and implementation of the system of "management by objective". Thus, it cannot only be used for fulfillment of the objectives of traditional budgeting but it can also be used for a variety of other purposes.

Even though ZBB is very beneficial for the efficiency and effectiveness of the organization, it suffers from the following limitations:

Limitations of zero-base budgeting: The Limitations of zero-base budgeting are as follows:

1. Various operational problems are likely to be faced in implementing the technique of ZBB. It requires the whole hearted support from the top management
2. It is time consuming as well as costly. It needs properly trained managerial personnel to do the required job.

In spite of the above limitations, the importance of ZBB technique is not diluted and it is considered to be an effective tool/technique for improving managerial efficiency.

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Cost Management – Suggested Answer CA Final Nov. 2008

Solution to Question No. 4 (c)

External

SP		4500	
Profit		2700	
Cost		1800	
			
	Variable		Fixed
	1440		360
	80%		20%

Variable Cost (1440 – 200)	1240
Fixed Cost	360
Total Cost	1600
Markup @ 150%	2400
Transfer Price	4000

- (i) Whenever transferor division is operating at full capacity, external transfer price shall be an ideal TP. However when services are diverted internally, cost saved and its impact on TP shall be passed in to transferee division. Transfer price shall be taken @ Rs. 4000 for each consulting day.
- (ii) For the team having spare time, it is only at cost of Rs. 1600 per consulting day, shall be the TP.
- (iii) TP will accordingly change as all of the cost and opportunity cost involved in the engagement of their services. Therefore the change is Rs. 3300 per consulting day.

1584000		
1584000	=	3300
240 x 2		

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Cost Management – Suggested Answer CA Final Nov. 2008

5. (a) State the characteristic features of a database created for operational control and decision making. 4
- (b) Discuss, how target costing may assist a company in controlling costs and pricing of products. 4
- (c) The costs and selling prices per unit of two products manufacturing by a company are as under : 11

Product	A (Rs.)	B (Rs.)
Selling Price	500	450
Variable costs :		
Direct Materials @ Rs. 25 per kg.	100	100
Direct Materials @ Rs. 20 per kg.	80	40
Painting @ Rs. 30 per hour	30	60
Variable overheads	190	175
Fixed costs @ Rs. 17.50/D.L.Hr.	70	35
Total costs	470	410
Profit	30	40

In any month the maximum availability of inputs is limited to the following :

Direct Materials	480 kg
Direct Labour hours	400 hours
Painting hours	200 hours

Required :

- (i) Formulate a linear programme to determine the production plan which maximizes the profits by using graphical approach.
- (ii) State the optimal product mix and the monthly profit derived from your solution in (i) above.
- (iii) If the company can sell the painting time at Rs. 40 per hour as a separate service, show what modification will be required in the formulation of the linear programming problem. You are required to re-formulate the problem but not to solve.

Solution to Question No. 5 (a)

Characteristics of a database created for operational control and decision making

- (i) Association of internal record with other ones.
- (ii) Cross functional integration
- (iii) Program/Data file independence
- (iv) Presence of common standards
- (v) DBMS
- (vi) Presence of dictionary
- (vii) Large scale direct access memory
- (viii) Multi-user facility
- (ix) Dynamic back up, recovery and retrieval
- (x) Easy language

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Cost Management – Suggested Answer CA Final Nov. 2008

Solution to Question No. 5 (b)

A comparative table is developed to find as how target costing would assist in controlling cost and price of products.

	Cost plus pricing	Target costing
a) First step	Ascertainment of Selling price(SP)	Ascertainment of Selling price(SP)
b) Margin fixation	As a % of cost (add to cost)	As a % on SP (deduct from SP)
c) Result	Setting price (a + b)	Target cost (a - b)
d) Market of operation	Monopolistic	Competitive
e) Direction	Forward	Retrograde(reverse)
f) Cost reduction	Absent	Attempted
f) Cost classification	No attempt is made	Value added & non-value added
g) Fixation of SP	By enterprise	By Market force

Solution to Question No. 5 (c)

	Per Unit	
	A	B
Selling Price	500	450
Dm @ Rs. 25/Kg	(4 kgs) 100	(4 Kgs) 100
DL @ Rs. 20/Hrs	(4 Hrs) 80	(2 Hrs) 40
Painting @ Rs. 30/Hr	(1 hr) 30	(2 Hrs) 60
Variable OH	190	175
	400	375
Contribution	100	75

Since FC/Unit is given without the level of present operations, it is difficult to find the overall fixed cost. Hence FC is a constant factor taken up as a deduction from contribution pool.

Maximise $Z = 100A + 75B - \text{Fixed Cost}$.

Constraints are

$$\begin{aligned}
 4A + 4B &\leq 480 \rightarrow \text{Kgs (in material)} \\
 4A + 2B &\leq 400 \rightarrow \text{Hrs (in Direct Labour)} \\
 1A + 2B &\leq 200 \rightarrow \text{Painting Hrs} \\
 \text{Where } A \text{ \& } B &\geq 0
 \end{aligned}$$

- (iii) If Painting hours were to be taken @ Rs. 40/hr
 Maxi $Z = 90A + 55B - \text{FC}$

Painting hours are to be captured @ Rs.40 in the computation of Contribution.

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Cost Management – Suggested Answer CA Final Nov. 2008

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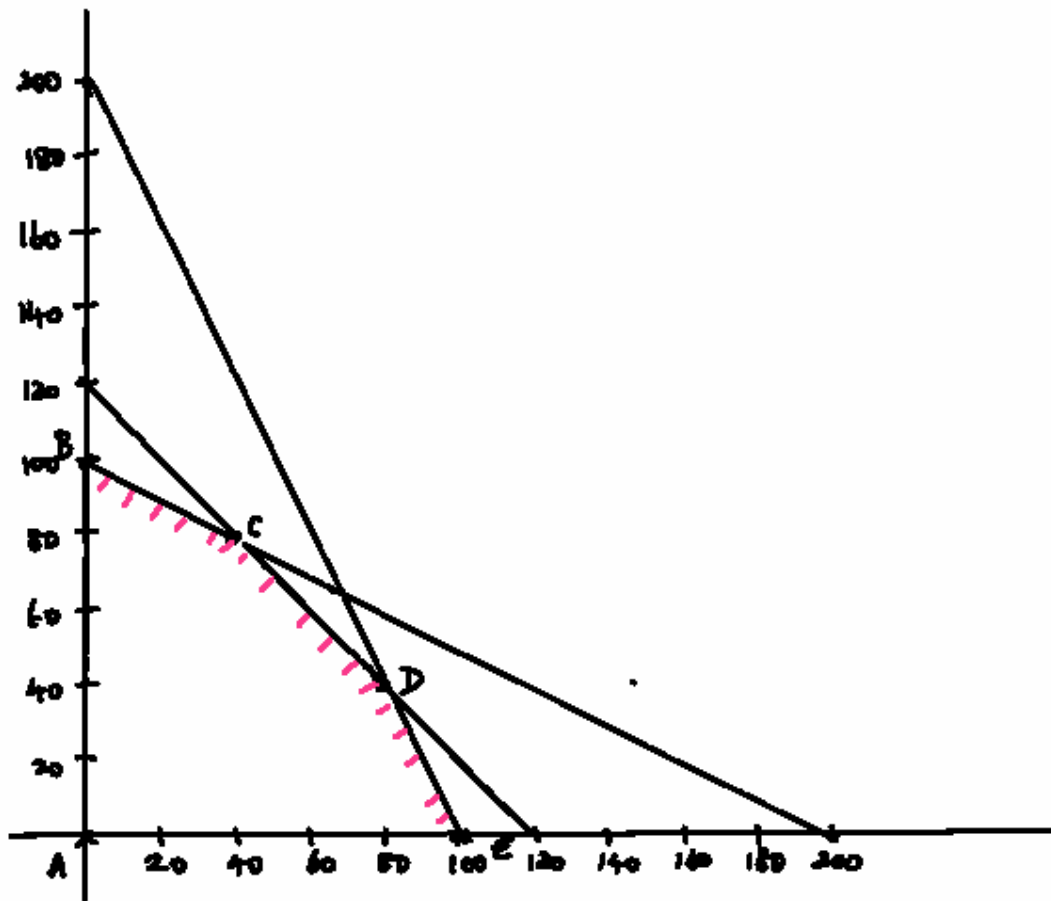
$$4A + 4B \leq 480$$

$$4A + 2B \leq 400$$

$$1A + 2B \leq 200$$

$$\text{Where } A \text{ \& } B \geq 0$$

Graphical expression of the solution to the first part.



From the above points of coordinates within the shaded area, the point of intersection indicated against D [80, 40], the profit is Rs.11000-FC is the best profit point.

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Cost Management – Suggested Answer CA Final Nov. 2008

6. (a) Enumerate the uses of Pareto Analysis. 3

(b) A single counter ticket booking centre employs one booking clerk. A passenger on arrival immediately goes to the booking counter for being served if the counter is free. If, on the other hand, the counter is engaged, the passenger will have to wait. The passengers are served on first come first served basis. The time of arrival and the time of service varies from one minute to six minutes. The distribution of arrival and service time is as under :

Arrival/Service Time (Minutes)	Arrival (Probability)	Service (Probability)
1	0.05	0.10
2	0.20	0.20
3	0.35	0.40
4	0.25	0.20
5	0.10	0.10
6	0.05	

Required :

(i) Simulate the arrival and service of 10 passengers starting from 9 A.M. by using the following random numbers in pairs respectively for arrival and service. Random numbers 60 09 16 12 08 18 36 65 38 25 07 11 08 79 59 61 53 77 03 10.

(ii) Determine the total duration of

- (1) Idle time of booking clerk and
- (2) Waiting time of passengers.

(c) A city health centre provides health and other related services to the citizens who are covered under insurance plan. The health centre receives a payment from the insurance company each time any patient attends the centre for consultation as under : 8

Consultations involving	Payment from Insurance company Rs.
No treatment	60
Minor treatment	250
Major treatment	500

Sreeram Coaching Point, Chennai Bangalore and Ernakulam
Cost Management – Suggested Answer CA Final Nov. 2008

In addition, the adult patients will have to make a co-payment which is equivalent to the amount of payment for the respective category of treatment made by the insurance company. However, children and senior citizens are not required to make any such co-payment.

The health centre will remain open for 6 day in a week for 52 weeks in a year. Each physician treated 20 patients per day although the maximum number of patients that could have been treated by a physician on any working day is 24 patients.

The health centre received a fixed income of Rs. 2,25,280 per annum for promotion of health products from the manufacturers.

The annual expenditure of the health centre is estimated as under :

Materials and consumable (100% variable)	Rs. 22,32,000
Staff salaries per annum per employee (fixed) :	
Physician	Rs. 4,50,000
Assistants	Rs. 1,50,000
Administrative staff	Rs. 90,000
Establishment and other operating costs (fixed)	Rs. 16,00,000

The non-financial information is as under :

(i) Staff :	
Number of physicians employed	6
Assistants	7
Administrative staff	2
(ii) Patient Mix :	
Adults	50%
Children	40%
Senior Citizens	10%
(iii) Mix of patient appointments (%)	
Consultation requiring no treatment	70%
Minor treatment	20%
Major treatment	10%

Required :

- (i) Calculate the Net income of the city health centre for the next year;
- (ii) Determine the percentage of maximum capacity required to be utilized next year in order to break even.

Solution to Question 6 (a)

Pareto analysis is useful to:

- Prioritize problems, goals, and objectives
- Identify root causes
- Select and define key quality improvement programs
- Select key customer relations and service programs
- Select key employee relations improvement programs

**Sreeram Coaching Point, Chennai Bangalore and Ernakulam
Cost Management – Suggested Answer CA Final Nov. 2008**

- Select and define key performance improvement programs
- Maximize research and product development time
- Verify operating procedures and manufacturing processes
- Product or services sales and distribution
- Allocate physical, financial and human resources

Solution to Question 6 (b)

Random No. Coding

Arrival Time Time (Min)	Probability	Cum Probability	Close Interval
1	05	05	00-04
2	20	25	05-24
3	35	60	25-59
4	25	85	60-84
5	10	95	85-94
6	05	100	95-99

Service Time (Min)	Probability	Cum Probability	Class Interval
1	10	10	00-09
2	20	30	10-29
3	40	70	30-69
4	20	90	70-89
5	10	100	90-99

Fitting of Random Nos.

	R Nos.	Time in Min
Arrival Nos		
1	60	4
2	16	2
3	08	2
4	36	3
5	38	3
6	07	2
7	08	2
8	59	3
9	53	3
10	03	1

Service	R Nos.	Service Time
1	09	1
2	12	2
3	18	2
4	65	3

Sreeram Coaching Point, Chennai Bangalore and Ernakulam
Cost Management – Suggested Answer CA Final Nov. 2008

5	25	2
6	11	2
7	79	4
8	61	3
9	77	4
10	10	2

Application of Model							
Customer No.	Expected Time	Gap	Arrival Time	Waiting Time in Min			
				Service time	Exit time	Customer	Service
1	9.00	4 m	9.04	1 m	9.05=9.04+0.1	-	4
2		2 m	9.06	2 m	9.08=9.06+0.02	-	1
3		2 m	9.08	2 m	9.10=9.08+0.02	-	-
4		3 m	9.11	3 m	9.14=9.11+0.03	-	1
5		3 m	9.14	2 m	9.16=9.14+0.02	-	-
6		2 m	9.16	2 m	9.18=9.16+0.02	-	-
7		2 m	9.18	4 m	9.22=9.18+0.04	-	-
8		3 m	9.21	3 m	9.25=9.22+0.03	1	-
9		3 m	9.24	4 m	9.29=9.25+0.04	1	-
10		1 m	9.25	2 m	9.31=9.29+0.02	4	-
						6	6

Arrivals are independent variable. The first customer enters by 9.04, therefore 4 minutes of idle time is noticed at the initial stage itself in the service counter. Waiting time of the person in the counter is the difference between the times at which the previous customer exited to the time at which the next customer arrives in service bay. Waiting time for the entering customer is the difference between the time of his arrival to the time he enters into the service counter.

Solution to Question No. 6 (c)

No. of patients per annum

→ $6 \times 52 \times 20 \times 6 = 37440$

Break up as follows				
		50% adults	40% Children	10% Senior citizens
Cons	26208	13104	10483.2	2620.8
Min.	7488	3744	2995.2	748.8
Maj.	3744	1872	1497.6	374.4
	37440	18720	14976	3744
Revenue	Rate	Adults		
Cons	60	1572480	628992	157248
Min	250	1872000	748800	187200
Maj	500	1872000	748800	187200
		5316480	2126592	531648
		7974720		

Sreeram Coaching Point, Chennai Bangalore and Ernakulam
Cost Management – Suggested Answer CA Final Nov. 2008

Income Statement

		83.33%=20/24	100%
Revenue Through Billings		7974720	9569664
Variable Costs		2232000	2678400
Contribution		5742726	6891264
Fixed Cost			
Physician	2700000		
Assistants	1050000		
Admn.	180000		
	3930000		
Establishment	1600000	5530000	5530000
Contribution		212720	1361264
Other Income Fixed		225280	225280
		438000	1586544

$$(ii) \text{ PV Ratio} = \frac{5742720}{7974720} = 72.01\%$$

$$\text{FC to be recovered } 5530000 - 225280 = 5304720$$

$$\text{BEP (Rs.)} = 5304720 / 72.01\% = 7366484$$

$$\text{BEP in \%} = [7366484 / 9569664] \times 100 = 76.98\% \text{ or } 77\%$$