THE INSTITUTE OF COST AND MANAGEMENT ACCOUNTANTS OF BANGLADESH

CMA DECEMBER, 2018 EXAMINATION

PROFESSIONAL LEVEL - IV

SUBJECT: 402. STRATEGIC MANAGEMENT ACCOUNTING

Model Solution

Solution to the question No. 1

(a)

If ROI is used to evaluate performance, a manager of an investment center may reject a profitable investment opportunity whose rate of return exceeds the company's required rate of return but whose rate of return is less than the investment center's current ROI.

The residual income approach overcomes this problem since any project whose rate of return exceeds the company's minimum required rate of return will result in an increase in residual income.

(b)

1.

The lowest acceptable transfer price from the perspective of the selling division is given by the following formula:

$$\text{Transfer price} \geq \text{Variable cost per unit} + \frac{\text{Total contribution margin on lost sales}}{\text{Number of units transferred}}$$

The Pulp Division has no idle capacity, so transfers from the Pulp Division to the Carton Division would cut directly into normal sales of pulp to outsiders. Since the costs are the same whether the pulp is transferred internally or sold to outsiders, the only relevant cost is the lost revenue of $70 per ton from the pulp that could be sold to outsiders.

This is confirmed below:

$$\text{Transfer price} \geq 42 + \frac{(\$70 - \$42) \times 5{,}000}{5000}$$

$$= \$42 + (\$70 - \$42) = \$70$$

Therefore, the Pulp Division will refuse to transfer at a price less than $70 a ton. The Carton Division can buy pulp from an outside supplier for $70 a ton, less a 10% quantity discount of $7, or $63 a ton. Therefore, the Division would be unwilling to pay more than $63 per ton.

$$\text{Transfer price} \leq \text{Cost of buying from outside supplier} = \$63$$

The requirements of the two divisions are incompatible. The Carton Division won't pay more than $63 and the Pulp Division will not accept less than $70. Thus, there can be no mutually agreeable transfer price and no transfer will take place.

2.

The price being paid to the outside supplier, net of the quantity discount, is only $63.

Lost revenue per ton	...$70
Outside supplier's price	$63
Loss in contribution margin per ton....	$7
Number of tons per year	× 5,000
Total loss in profits	$35,000

Profits in the Carton Division will remain unchanged, since it will be paying the same price internally as it is now paying externally.

If the Pulp Division meets this price, then profits in the Pulp Division and in the company as a whole will drop by $35,000 per year:

3.
The Pulp Division has idle capacity, so transfers from the Pulp Division to the Carton Division do not cut into normal sales of pulp to outsiders. In this case, the minimum price as far as the Carton Division is concerned is the variable cost per ton of $42. This is confirmed in the following calculation:

$$\text{Transfer price} \geq 42 + \frac{\$0}{5000}$$
$$= \$42$$

The Carton Division can buy pulp from an outside supplier for $63 a ton and would be unwilling to pay more than that for pulp in an internal transfer. If the managers understand their own businesses and are cooperative, they should agree to a transfer and should settle on a transfer price within the range:

$$\$42 \leq \text{Transfer price} \leq \$63$$

4.
Yes, $59 is a bona fide outside price. Even though $59 is less than the Pulp Division's $60 "full cost" per unit, it is within the range given in Part 3 and therefore will provide some contribution to the Pulp Division.

If the Pulp Division does not meet the $59 price, it will lose $85,000 in potential profits:

Price per ton	$59
Less variable costs	42
Contribution margin per ton	$17

5,000 tons × $17 per ton = $85,000 potential increased profits. This $85,000 in potential profits applies to the Pulp Division and to the company as a whole.

5.
No, the Carton Division should probably be free to go outside and get the best price it can. Even though this would result in sub-optimization for the company as a whole, the buying division should probably not be forced to buy inside if better prices are available outside.

6.
The Pulp Division will have an increase in profits:

Selling price	$70
Less variable costs	42
Contribution margin per ton	$28

5,000 tons × $28 per ton = $140,000 increased profits

The Carton Division will have a decrease in profits:

Inside purchase price	$70
Outside purchase price	59
Increased cost per ton	$11

5,000 tons × $11 per ton = $55,000 decreased profits

The company as a whole will have an increase in profits:

Increased contribution margin in the Pulp Division	$28
Decreased contribution margin in the Carton Division	11
Increased contribution margin per ton	$17

5,000 tons × $17 per ton = $85,000 increased profits

So long as the selling division has idle capacity, profits in the company as a whole will increase if internal transfers are made. However, there is a question of fairness as to how these profits should be split between the selling and buying divisions. The inflexibility of management in this situation damages the profits of the Carton Division and greatly enhances the profits of the Pulp Division.

Solution to the question No. 2
(a)

Quality of conformance

The degree to which a product or service meets or exceeds its design specifications and is free of defects or other problems that mar its appearance or degrade its performance.

Taguchi Loss Function. Developed by Genichi Taguchi, it is a graphical representation of how an increase in variation within specification limits leads to an **exponential** increase in customer dissatisfaction.

Taguchi uses Quadratic Equation to determine loss Curve

- $L(x) = k(x-N)^2$
  - Where L (x) Loss Function,
  - $k = C/d^2$ Constant of proportionality, where
    C Loss associated with sp limit
  - d - Deviation of specification from target value
  - x Quality Features of selected product,
  - N Nominal Value of the product and
  - (x-N) Tolerance
- A real life example of the Taguchi Loss Function would be the quality of food compared to expiration dates.

Limitations of Quality Cost Information

- Simply measuring quality cost problems does not solve quality problems
- Results usually lag behind quality improvement programs.
- The most important quality cost, lost sales, is often omitted from quality cost reports.

(b)

Florex Company Quality Cost Report				
	Last Year		This Year	
	Amount (in thousands)	Percent of Sales	Amount (in thousands)	Percent of Sales
Prevention costs				
Quality engineering	420	0.56	$ 570	0.76
Systems development	480	0.64	750	1.00
Statistical process control	0	0.00	180	0.24
Total prevention costs	900	1.20	1,500	2.00
Appraisal costs				
Inspection	750	1.00	900	1.20
Product testing	810	1.08	1,200	1.60
Supplies used in testing	30	0.04	60	0.08
Depreciation of test equipment	210	0.28	240	0.32
Total appraisal costs	1,800	2.40	2,400	3.20
Internal failure costs				
Net cost of scrap	630	0.84	1,125	1.50

Rework labor	1,050	1.40	1,500	2.00
Disposal of defective products	720	0.96	975	1.30
Total internal failure costs	2,400	3.20	3,600	4.80
External failure costs				
Cost of field servicing	1,200	1.60	900	1.20
Warranty repairs	3,600	4.80	1,050	1.40
Product recalls	2,100	2.80	750	1.00
Total external failure costs	6,900	9.20	2,700	3.60
Total quality cost	$12,000	16.00	$10,200	13.60

ii.

The overall impact of the company's increased emphasis on quality over the past year has been positive in that total quality costs have decreased from 16% of sales to 13.6% of sales. Despite this improvement, the company still has a poor distribution of quality costs. The bulk of the quality costs in both years is traceable to internal and external failure, rather than to prevention and appraisal. Although the distribution of these costs is poor, the trend this year is toward more prevention and appraisal as the company has given more emphasis on quality.

Probably due to the increased spending on prevention and appraisal activities during the past year, internal failure costs have increased by one half, going from $2.4 million to $3.6 million. The reason internal failure costs have gone up is that, through increased appraisal activity, defects are being caught and corrected before products are shipped to customers. Thus, the company is incurring more cost for scrap, rework, and so forth, but it is saving huge amounts in field servicing, warranty repairs, and product recalls. External failure costs have fallen sharply, decreasing from $6.9 million last year to just $2.7 million this year.

If the company continues its emphasis on prevention and appraisal—and particularly on prevention—its total quality costs should continue to decrease in future years. Although internal failure costs are increasing for the moment, these costs should decrease in time as better quality is designed into products. Appraisal costs should also decrease as the need for inspection, testing, and so forth decreases as a result of better engineering and tighter process control.

(c)

i.

	Present	New Line	Total
(1) Sales.....	$10,000,000	$2,000,000	$12,000,000
(2) Net operating income	$800,000	$160,000	$960,000
(3) Operating assets	$4,000,000	$1,000,000	$5,000,000
(4) Margin (2) ÷ (1)	8%	8%	8%
(5) Turnover (1) ÷ (3)	2.5	2.0	2.4
(6) ROI (4) × (5)	20.0%	16.0%	19.2%

* Sales $2,000,000
Less variable expenses (60% × $2,000,000)... 1,200,000
Contribution margin 800,000
Less fixed expenses .... .640,000
Net operating income..... ... . $ 160,000

ii. Dell Havasi will be inclined to reject the new product line, since accepting it would reduce his division's overall rate of return.

iii. The new product line promises an ROI of 16%, whereas the company's overall ROI last year was only 15%. Thus, adding the new line would increase the company's overall ROI.

iv.

a.	Present	New Line	Total
Operating assets	$4,000,000	$1,000,000	$5,000,000
Minimum return required	12%	12%	12%
Minimum net operating income	$ 480,000	$ 120,000	$ 600,000
Actual net operating income	$ 800,000	$ 160,000	960,000
Minimum net operating income(above)	480,000	120,000	600,000
Residual income	$ 320,000	$ 40,000	$ 360,000

b. Under the residual income approach, Dell Havasi would be inclined to accept the new product line, since adding the line would increase the total amount of his division's residual income, as shown above.

Solution to the question No. 3

(a)

Required (i):
The following table presents the $37,500 cash savings that would result if Margro Corporation adopted the just-in-time inventory system in 2011.

Annual Relevant Costs of Current Purchasing Policy and JIT Purchasing Policy
For Margro Corporation

	Relevant Costs under Current Purchasing Policy	Relevant Costs under JIT Purchasing Policy
Required return on investment		
20% per year * $600,000 of average inventory per year	$120,000	
20% per year * $0 inventory per year		$ 0
Annual insurance and property tax costs	14,000	0
Warehouse rent	60,000	(13,500)a
Overtime costs		
No overtime	0	
Overtime premium		40,000
Stockout costs		
No stockouts	0	
$6.50b contribution margin per unit * 20,000 units		130,000
Total incremental costs	$194,000	$156,500
Difference in favor of JIT purchasing		$37,500

a $(13,500) = Warehouse rental revenues, [(75%*12,000) *$1.50].
b Calculation of unit contribution margin

Selling price ($10,800,000 ÷ 900,000 units)	$12.00
Variable costs per unit:	
Variable manufacturing cost per unit ($4,050,000 ÷ 900,000 units)	$4.50
Variable marketing and distribution cost per unit ($900,000 ÷ 900,000 units)	1.00
Total variable costs per unit	5.50
Contribution margin per unit	$ 6.50

Note that the incremental costs of $40,000 in overtime premiums to make the additional 15,000 units are less than the contribution margin from losing these sales equal to $97,500 ($6.50*15,000). Margro would rather incur overtime than lose 15,000 units of sales.

Required (ii):
Conditions that should exist in order for a company to successfully adopt just-in-time purchasing include the following:

- Top management must be committed and provide the necessary leadership support to ensure a company-wide, coordinated effort.
- A detailed system for integrating the sequential operations of the manufacturing process needs to be developed and implemented. Direct materials must arrive when needed for each subassembly so that the production process functions smoothly.
- Accurate sales forecasts must be available for effective finished goods planning and production scheduling.
- Products should be designed to maximize use of standardized parts to reduce manufacturing time and costs.
- Reliable vendors who can deliver quality direct materials on time with minimum lead time must be obtained.

(c)
Let x_1, x_2, x_3 denote the number of Deluxe, Standard & Economy tour packages to be offered to 200 persons that will maximize the profit. In other words, the total number of tours of three types offered by the concern is restricted to 200 only to maximize its profits. The contribution (per person) arising out of each type of tour package offered is as follows:

Packages Offered	Price	Hotel Costs	Meals & other	Net Profit
Deluxe	10,000	3,000	4,750	2,250
Standard	7,000	2,200	2,500	2,300
Economy	6,500	1,900	2,200	2,400

The travel agent has to pay the flat fee of Rs. 2,00,000 for the chartered aircraft for the entire trip.
Consequently the objective function (profit function) will be:
Max Z = $2,250\,x_1 + 2,300x_2 + 2,400x_3 - 2,00,000$

The objective of the profit function is to maximize the profit.
The constraints based on the given conditions (i) to (v) are as follow:
$x_1 \geq 20$ from condition (i) $x_3 \geq 60$ from condition (iii)
$x_2 \geq 70$ from condition (ii) $x_1 \leq 60$ from conditions (iv)
$x_2 \leq 140$ from condition (ii) $x_1 + x_2 \geq 120$ from condition (v)
Also $x_1 + x_2 + x_3 = 200$, $x_1, x_2, x_3 \geq 0$

On combining suitably, the above constraints reduce to the following constraints:

$20 \leq x_1 \leq 60$
$70 \leq x_2 \leq 140$
$x_3 \geq 60$
$x_1 + x_2 \geq 120$
$x1 + x2 + x_3 = 200$ & $x1, x2, x3 \geq 0$

(i)
The linear programming problem formulated from the given data is:
Max Z = $2,250\,x1 + 2,300x2 + 2,400x3 - 2,00,000$
Subject to constraints

$20 \leq x1 \leq 60$
$70 \leq x2 \leq 140$
$x3 \geq 60$

$x1 + x2 \geq 120$
$x1 + x2 + x3 = 200$
$x1, x2, x3 \geq 0$

(ii)

Since $x_1 + x_2 + x_3 = 200$ or $x3 = 200 - (x1 + x2)$

Substitute the value of x_3 in the relations mentioned under (a), the linear programming problem reduces to the following:

Maximize $Z = -150x_1 + 100x_2 + 2{,}800{,}000$

Subject to $20 \leq x_1 \leq 60$

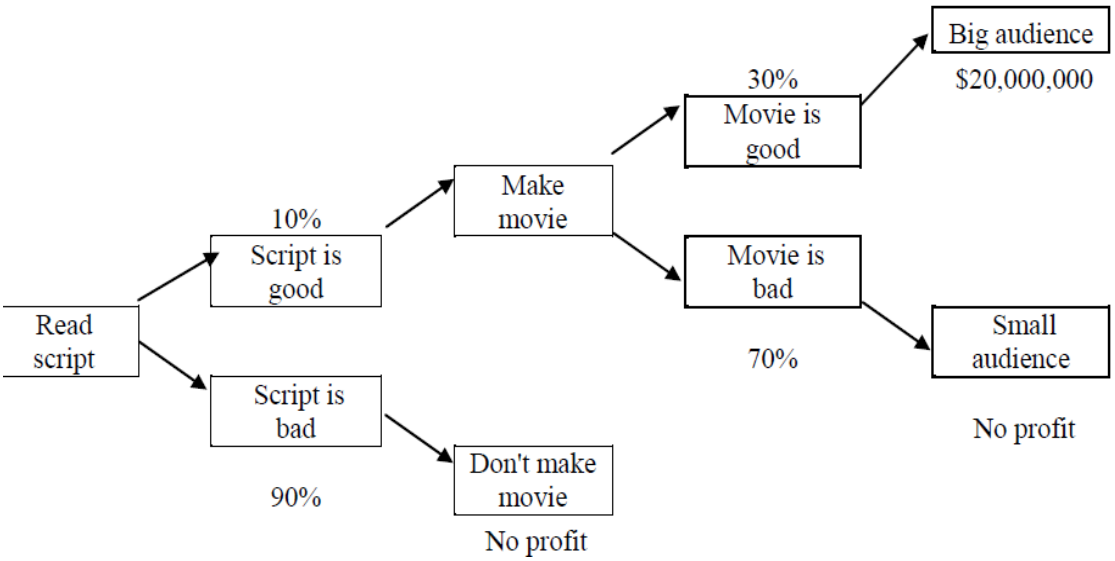
$70 \leq x_2 \leq 140$

$120 \leq x_1 + x_2 \leq 140$

& $x_1, x_2 \geq 0$

Solution to the question No. 4

(a) The payoff from taking the lump sum is $12,000, so we need to compare this to the expected payoff from taking one percent of the profit. The decision tree for the movie project is:



The value of one percent of the profits as follows. There is a 30 percent probability the movie is good, and the audience is big, so the expected value of this outcome is:

Value = $20,000,000 × .30

Value = $6,000,000

The value if the movie is good, and has a big audience, assuming the script is good is:

Value = $6,000,000 × .10

Value = $600,000

This is the expected value for the studio, but the screenwriter will only receive one percent of this amount, so the payment to the screenwriter will be:

Payment to screenwriter = $600,000 × .01

Payment to screenwriter = $6,000

The screenwriter should take the upfront offer of $12,000.

(b) We can calculate the value of the option to wait as the difference between the NPV of opening the mine today and the NPV of waiting one year to open the mine. The remaining life of the mine is:
60,000 ounces / 7,500 ounces per year = 8 years
This will be true no matter when you open the mine. The after tax cash flow per year if opened today is:
CF = 7,500($450) = $3,375,000
So, the NPV of opening the mine today is:
NPV = –$14,000,000 + $3,375,000(PVIFA12%,8)
NPV = $2,765,784.21

If you open the mine in one year, the cash flow will be either:
CF Up = 7,500($500) = $3,750,000 per year
CF Down = 7,500($410) = $3,075,000 per year

The PV of these cash flows is:
Price increase CF = $3,750,000(PVIFA12%,8) = $18,628,649.13
Price decrease CF = $3,075,000(PVIFA12%,8) = $15,275,492.28
So, the NPV is one year will be:
NPV = –$14,000,000 + [.60($18,628,649.13) + .40($15,275,492.28)]
NPV = $3,287,386.39
And the NPV today is:
NPV today = $3,287,386.39 / 1.12
NPV today = $2,935,166.42

So, the value of the option to wait is:
Option value = $2,935,166.42 – 2,765,784.21
Option value = $169,382.21

= THE END =