# Gurukripa's Guideline Answers to May 2015 Exam Questions
# CA Final – Advanced Management Accounting

Question No.1 is compulsory **(4 × 5 = 20 Marks).**
Answer **any five** questions from the **remaining six** questions **(16 × 5 = 80 Marks).** [Answer any 4 out of 5 in Q.7]
Working Notes should form part of the answers.

**Note:** Page Number References are from **"Padhuka's A Referencer on Advanced Management Accounting"**

## Question 1(a): ROCE Pricing — 5 Marks

**A Company produces a single product 'Impex'.**

**For an Annual Sales of 40,000 units of Impex, Fixed Overhead is ₹ 5,50,000. The Variable Cost per unit is ₹ 60. Capital Employed in Fixed Assets is ₹ 8,00,000 and in Current Assets is 50% of Net Sales (i.e. Sales less Discount). The Company sells goods at 20% discount on the Maximum Retail Price (M.R.P), which is ₹ X per unit. The Company wants to earn a Return of 25% before tax on Capital Employed in Fixed and Current Assets.**

**Determine the value of X.**

**Solution:** **Similar to Page No. 3.20, Illustration 8 – [M 05, N 10]**

Let Selling Price be ₹ X per unit. Hence, Sales Value (net of 20% Discount) = 80% × 40,000 Units × 'X' = 32,000 X

| | | |
|---|---|---|
| | Sales | 32,000 X |
| **Less:** | Variable Costs (₹ 60 × 40,000 Units) | 24,00,000 |
| | Contribution | 32,000 X – 24,00,000 |
| **Less:** | Fixed Costs | 5,50,000 |
| | Profit Before Tax (PBT) | 32,000 X – 29,50,000 |
| **PBT** | = 25% on Capital Employed (Fixed Assets + Current Assets).<br>= 25% of [8,00,000 + 50% of Net Sales (i.e. 32,000 X)]<br>= 25% of [8,00,000 + 16,000 X] | 2,00,000 + 4,000 X |

Hence, 32,000 X – 29,50,000 = 2,00,000 + 4,000 X.

28,000 X = 31,50,000

So, $X = \frac{31,50,000}{28,000}$ = **₹ 112.50** Therefore, Maximum Retail Price = **₹ 112.50 per unit**.

## Question 1(b): Assignment — 5 Marks

**Methods I, II III and IV are available for one–to–one assignment to Factories A, B and C. The time taken (in hours) for implementing these Methods in the Factories is tabulated below with the objective of minimization.**

| | (Time Taken – hours) | | |
|---|---|---|---|
| **Methods** | **Factory A** | **Factory B** | **Factory C** |
| **I** | **35** | **25** | **28** |
| **II** | **23** | **32** | **25** |
| **III** | **25** | **42** | **21** |
| **IV** | **35** | **35** | **28** |

**(i) Show the Optimal Assignment by circling the cells using the Assignment Algorithm (Description of Algorithm is not required). Which Method will not be implemented?**

**(ii) What is the Minimum Savings (in hours) required over the current given duration, for preferring the implementation of the Method identified in (i) above? When it so justifies, which Method will it replace? Why?**

**Solution:** **Similar to Page No.16.7, Illustration 7 – [N 86]**

**I. Time Matrix**

| | | |
|---|---|---|
| 35 | 25 | 28 |
| 23 | 32 | 25 |
| 25 | 42 | 21 |
| 35 | 35 | 28 |

**II. Inserting Dummy Column,**

| | | | |
|---|---|---|---|
| 35 | 25 | 28 | 0 |
| 23 | 32 | 25 | 0 |
| 25 | 42 | 21 | 0 |
| 35 | 35 | 28 | 0 |

**III. Row and Column Operations**

| | | | |
|---|---|---|---|
| 12 | 0 | 7 | 0 |
| 0 | 7 | 4 | 0 |
| 2 | 17 | 0 | 0 |
| 12 | 10 | 7 | 0 |

**Note:**

- Row Operations will result in the same matrix, since there is one zero in each Row. Hence, Column Operation Matrix is stated in Step III above.
- Lines are also drawn in the Step III Matrix. No. of Lines = Order of Matrix = 4. So, Optimal Assignment is possible.

**4.Optimal Assignment**

| | | | |
|---|---|---|---|
| 12 | [0] | 7 | ~~0~~ |
| [0] | 7 | 4 | ~~0~~ |
| 2 | 17 | [0] | ~~0~~ |
| 12 | 10 | 7 | [0] |

**5.Answer:**

| Method | To | Duration |
|---|---|---|
| I | B | 25 |
| II | A | 23 |
| III | C | 21 |
| IV | D (Dummy) | – |
| | | **69** |

1. **Method IV** will not be implemented. (due to allocation of Dummy Column)
2. **Replacement of Method IV**

| | **Factory** | **A** | **B** | **C** |
|---|---|---|---|---|
| | Method IV Time | 35 | 35 | 28 |
| (–) | Optimum Method Time | Method II = 23 | Method I = 25 | Method III = 21 |
| | **Time Saving Required** | **12** | **10** | **7** |

Minimum of above = Required Time Saving = **7 hours**. Method IV will then replace Method III to Factory 'C'.

**Question 1(c): Transfer Pricing – Effect of different Transfer Prices in Scenarios** **5 Marks**

**G is the Transferring Division and R, the Receiving Division in a Company. R has a demand for 20% of G's production capacity which has to be first met as per the Company's Policy. State with reason, which Division, G or R enjoys more advantage in each of the following independent situations, assuming no inventory build–up.**

| Sl. No. | G transfers to R at Transfer Price equal to | G's Production Level | External Demand | Division having more advantage | Reason |
|---|---|---|---|---|---|
| (i) | Full Cost; No markup | 60% | 40% | | |
| (ii) | Market Price | 80% | 60% | | |
| (iii) | Marginal Cost | 100% | 80% | | |
| (iv) | Market Price | 100% | 90% | | |

**(Only the Sl. No. Column and last Two Columns need to be written in the Answer Books).**

**Solution:** **Refer Principles in Chapter 5**

| Sl. No. | Division having more advantage | Reason |
|---|---|---|
| (i) | **G** | Recovery of Above Marginal Cost with Slackness in Demand. |
| (ii) | **G** | Transfer Price = Market Price, inspite of no external market for G. |
| (iii) | **R** | No incentive to G for Internal Transfer. Only Marginal Cost is reimbursed. |
| (iv) | **G** | Transfer Price = Market Price, Opportunity Cost is fully recovered. |

**Question 1(d): Make or Buy – Relevant Costs** **5 Marks**

**PQ Limited manufactures and sells a range of products. For one of its products, it makes 2,000 units of a Component which has the following Budgeted Manufacturing Cost:**

| Particulars | Cost per unit |
|---|---|
| Direct Materials | ₹ 8,000 |
| Direct Labour (specially skilled) (40 hours @ ₹ 150 per hour) | ₹ 6,000 |
| Variable Overhead (40 hours @ ₹ 75 per hour) | ₹ 3,000 |
| Allocated Fixed Overhead | ₹ 10,000 |
| Total Production Cost | ₹ 27,000 |

**Softech Limited has offered to supply the component at a Guaranteed Price of ₹ 25,000 per unit.**

**If the component is not manufactured by PQ Limited, all the Direct Labour thus released can be employed in increasing the production by 1,600 units of an Existing Product K, which uses 50 of this type of Direct Labour Hours per unit. K is sold for ₹ 45,000 per unit and has a Marginal Cost of Production of ₹ 30,000 per unit and has sufficient market demand. The Direct Labour Force cannot be retrenched or recruited for the next two production periods. From a financial perspective, using Incremental Cost Analysis, would you advice PQ Ltd to make or buy the component for the forthcoming production period?**

**Solution:** **Refer Principles in Chapter 2 and Chapter 3**

1. **Direct Labour Cost:** Direct Labour Hours (DLH) required for Component = 2,000 units × 40 = 80,000 hours. DLH required for Product K = 1,600 units × 50 = 80,000 hours. Hence, all of DLH can be re–directed for Product K. Since, the Labour Force cannot be retrenched in the short–run, it is a **committed cost**, hence irrelevant.

2. **Incremental Cost of Making 2,000 units of Component:**

| Particulars | | ₹ |
|---|---|---|
| Direct Materials (Variable & Relevant) | (₹ 8,000 × 2,000 units) | 1,60,00,000 |
| Variable OH (Variable & Relevant) | (₹ 3,000 × 2,000 units) | 60,00,000 |
| Fixed OH (Allocation, Irrelevant) | | Nil |
| Loss of Contribution on Product K (opportunity cost, relevant) (₹ 45,000 – ₹ 30,000) × 1,600 units = | | 2,40,00,000 |
| **Total** | | **4,60,00,000** |

3. **Decision:** Average Incremental Cost of Making **=** $\frac{₹\ 4,60,00,000}{2,000\ \text{units}}$ **= ₹ 23,000 p.u.**

   Since the External Buying Cost ₹ 25,000 is higher, it is advisable to **make** the component during the forthcoming period.

**Question 2(a): Flexible Budget and Variance Analysis** **8 Marks**

**Tricon Co. has prepared the following statement for the month of April 2015.**

| Particulars | Budget Details | Static Budget | Actual |
|---|---|---|---|
| Units produced & Sold | | 4,000 | 3,200 |
| Direct Materials | 3 kg p.u. @ ₹ 15 per kg. | ₹ 1,80,000 | ₹ 1,55,000 |
| Direct Labour | 1 hr. p.u @ ₹ 36 per hour. | ₹ 1,44,000 | ₹ 1,12,800 |
| Variable Overhead | 1 hr. p.u. @ ₹ 22 per hour. | ₹ 88,000 | ₹ 73,600 |
| Fixed Overhead | | ₹ 90,000 | ₹ 84,000 |
| Total Cost | | ₹ 5,02,000 | ₹ 4,25,400 |
| Sales | | ₹ 6,00,000 | ₹ 4,48,000 |
| Profit | | ₹ 98,000 | ₹ 22,600 |

**During the month, 10,000 kg. of Materials and 3,100 Direct Labour Hours were utilized.**

**(i) Prepare a Flexible Budget for the month.**

**(ii) Determine the Material Usage Variance and the Direct Labour Rate Variance for the Actual Vs Flexible Budget.**

**Solution:** **Refer Principles in Chapter 7 Budgeting and Chapter 1 Standard Costing**

**1. Flexible Budget for 3200 units**

| Particulars | Computation | ₹ |
|---|---|---|
| Direct Materials | 3 kg × ₹ 15 per kg × 3,200 units | 1,44,000 |
| Direct Labour | 1 hr p.u. × ₹ 36 per hr × 3,200 units | 1,15,200 |
| Variable Overhead | 1 hr p.u. × ₹ 22 per hr × 3,200 units | 70,400 |
| Absorbed Fixed Overhead | $\frac{₹\ 90,000}{4000\ \text{units}} \times 3,200$ units | 72,000 |
| **Total Costs** | | **4,01,600** |
| **Sales** | $\frac{₹\ 6,00,000}{4000\ \text{units}} \times 3,200$ units | **4,80,000** |
| **Profit** | | **78,400** |

**2. Material Usage Variance** = (Standard Quantity **Less** Actual Quantity) × Standard Price
= [(3,200 units × 3 kg) – 10,000 kg] × ₹ 15
= (9,600 kg – 10,000 kg) × ₹ 15 = **₹ 6,000 A**

**3. Labour Rate Variance** = Actual Hours × (Standard Rate **Less** Actual Rate)
= (Actual Hours × Standard Rate) **Less** (Actual Hours × Actual Rate)
= (3,100 hrs × ₹ 36) – ₹ 1,12,800 (given Actual Labour Cost) = **₹ 1,200 A**

**Question 2(b): Linear Programming** **8 Marks**

**The following information is given relating to the simplex method of a linear program with the usual notations.**

| | | |
|---|---|---|
| **Objective Function:** | **$Z = x_1 + 5x_2$** | **(1)** |
| **Constraints:** | **$6x_1 + 8x_2 \leq 12$** | **(2)** |
| | **$5x_1 + 15x_2 \geq 10$** | **(3)** |
| | **$x_1, x_2 \geq 0$** | **(4)** |

**Let $s_1$ be the variable introduced to re–state (2) as an equality and let $s_2$ and $A_2$ be variables to re–state (3) as an equality.**
**If the Objective is to Maximize Z –**

**(i) What will be the Coefficients of $s_1$, $s_2$ and $A_2$ in Equation (1) and (3) re–stated as Equality?**
**(ii) Identify the Slack and Surplus Variables.**
**(iii) Which Variables will form part of the Initial Solution? Why?**
**(iv) If the Objective is to Minimize Z, what will be your answer to (i) above?**

**Solution:** **Refer Principles in Chapter 18**

| Particulars | $s_1$ | $s_2$ | $A_2$ |
|---|---|---|---|
| (i) Coefficient for Maximisation Objective in | | | |
| (a) Objective Function $Z = x_1 + 5x_2$ | 0 | 0 | –M (M= Infinity Cost) |
| (b) Constraint Function $5x_1 + 15x_2 \geq 10$ | 0 | –1 | 1 |
| (ii) Nature of Variable | Slack | Surplus | Artificial |
| (iii) Will it be in Initial Solution? | Yes | No (Unit Matrix not formed due to –1 Coefficient) | Yes |
| (iv) Coefficient in Objective Function for Minimisation Objective | 0 | 0 | +M (M = Infinity Cost) |

**Question 3(a): Differential Fixed Costs and Ranking with Key Factor** **8 Marks**

**Apex Limited manufactures two products, P and Q, using the same production facility. The following information is available for a production period:**

| Particulars | Product P | Product Q |
|---|---|---|
| **Demand (units)** | **2,20,000** | **1,75,000** |
| **Contribution (₹/unit)** | **10** | **12** |
| **Machine hours required per 100 units** | **15** | **25** |

**P and Q can be produced only in batches of 100 units, and whatever is produced has to be sold or discarded. Inventory build–up is not possible from one production period to another. The Total Fixed Costs for each level of production and directly attributable to P and Q are given below:**

| Level of Output | Total Fixed Costs Product P | Product Q |
|---|---|---|
| **Upto 1,00,000 units** | **₹ 6,00,000** | **₹ 5,50,000** |
| **1,00,001 to 2,00,000 units** | **₹ 13,50,000** | **₹ 12,20,000** |
| **2,00,001 to 3,00,000 units (maximum possible level)** | **₹ 18,70,000** | **₹ 15,50,000** |

**75000 Machine Hours are available in the production period.**

**(i) Calculate the quantities of P & Q in the best product mix to achieve the maximum profit and compute the maximum profit.**
**(ii) What will be the Opportunity Cost of meeting P's demand fully?**

**Solution:** **Concept Similar to Page 2.63, Illustration No.5.4**

**1. Ranking Table** (based on Fixed Costs, Incremental Profits, etc.)

| Particulars | Upto 1,00,000 units | 1,00,001–2,00,000 units | 2,00,001–3,00,000 units |
|---|---|---|---|
| 1. **For Product P:** | | | |
| (a) Total Contribution | 1,00,000 × ₹ 10 = ₹ 10,00,000 | 2,00,000 × ₹ 10 = ₹ 20,00,000 | (Max) 2,20,000× ₹ 10 = ₹ 22,00,000 |
| (b) Fixed Costs of this level | ₹ 6,00,000 | ₹ 13,50,000 | ₹ 18,70,000 |
| (c) Profit of this level (a–b) | ₹ 4,00,000 | ₹ 6,50,000 | ₹ 3,30,000 |
| (d) Incremental Profit (from c) | **₹ 4,00,000** | 6,50,000 – 4,00,000 = **₹ 2,50,000** | 3,30,000 – 6,50,000 = **₹ (3,20,000)** |
| **Ranking** | **II** | **III** | |
| 2. **For Product Q:** | | | |
| (a) Total Contribution | 1,00,000× ₹ 12 = ₹ 12,00,000 | (Max) 1,75,000× ₹ 12 = ₹ 21,00,000 | Not Applicable |
| (b) Fixed Costs of this level | ₹ 5,50,000 | ₹ 12,20,000 | Not Applicable |
| (c) Profit of this level (a–b) | ₹ 6,50,000 | ₹ 8,80,000 | Not Applicable |
| (d) Incremental Profit (from c) | **₹ 6,50,000** | 8,80,000 – 6,50,000 = **₹ 2,30,000** | Not Applicable |
| **Ranking** | **I** | **IV** | |

**Note: Ranking Priority** for allocation of Machine Hours will be based on Lines (1d) and (2d) above.

**3. Allocation of Machine Hours and Profitability**

| Description | Hours Allocated for P | Hours Allocated for Q | Cumulative Profit | Cumulative Hrs |
|---|---|---|---|---|
| First 1,00,000 units of Q (as per Line 2d) | Nil | $\frac{1,00,000}{100}$ ×25=25,000 hrs | **₹ 6,50,000** | 25,000 hrs |
| First 1,00,000 units of P (as per Line 1d) | $\frac{1,00,000}{100}$ ×15 = 15,000 hrs | Nil | 6,50,000+4,00,000 = **₹ 10,50,000** | 25,000+15,000 = 40,000 hrs |
| Next 1,00,000 units of P (as per Line 1d) | $\frac{1,00,000}{100}$ ×15 = 15,000 hrs | Nil | 10,50,000+2,50,000 = **₹ 13,00,000** | 40,000+15,000 = 55,000 hrs |
| Next 75,000 units of Q (as per Line 2d) | Nil | $\frac{75,000}{100}$ × 25 = 18,750 hrs | 13,00,000+2,30,000 = **₹ 15,30,000** | 55,000+18,750 = 73,750 hrs |

**Quantity Produced:** P: 2,00,000 units, Q: 1,75,000 units.

**3. Opportunity Cost of meeting P's Demand fully**

| Particulars | Computation | Result |
|---|---|---|
| Additional Units required for meeting P's demand Fully | 2,20,000 – 2,00,000 | 20,000 Units |
| Machine Hours required for 20,000 Units of P | $\frac{20,000}{100}$ × 15 | 3,000 Hours |
| **Less:** Balance Spare Capacity in Slab IV (from WN 2) | = 75,000 – 73,750 | 1,250 hours |
| Balance Hours required to be diverted from Q (IV Rank Slab) | | 1,750 hours |
| This time is to be diverted from Production of Q (IV Rank) at | $\frac{2,30,000}{18,750}$ | ₹ 12.27 per hour |
| Opportunity Cost = Contribution Lost on Q for 1,750 hours | ₹ 12.27 × 1,750 Hours | **₹ 21,473** |

**Alternative view:** Cost of meeting full demand of P = as per Line 1d in WN 1 = = **₹ (3,20,000)**

**Question 3(b): Relevant Costs Analysis** **4 Marks**

**Rabi Ltd is considering the discontinuous of Division C. The following information is given: (Figures – ₹)**

| Particulars | Divisions A & B | Division C | Total |
|---|---|---|---|
| **Sales (Maximum achievable)** | **41,40,000** | **5,17,500** | **46,57,500** |
| **Less: Variable Cost** | **20,70,000** | **2,76,000** | **23,46,000** |

| Particulars | | Divisions A & B | Division C | Total |
|---|---|---|---|---|
| | Contribution | 20,70,000 | 2,41,500 | 23,11,500 |
| Less: | Specific Avoidable Fixed Cost | 14,49,000 | 4,14,000 | 18,63,000 |
| | Divisional Income | 6,21,000 | (1,72,500) | 4,48,500 |

**The rates of Variable Costs are 90% of the Normal Rates due to the current volume of operation. There is adequate market demand. For any lower volume of operation, the rates would go back to the Normal Rates.**

**Facilities released by discounting Division C cannot be used for any other purpose.**

**Evaluate the decision to discontinue Division C using Relevant Cost Approach.**

**Solution:** **Refer Principles in Chapter 4 Relevant Cost Analysis**

**1. Cost–Benefit Analysis of discontinuing Division C**

| Costs | ₹ | Benefits | ₹ |
|---|---|---|---|
| Additional Variable Costs of 10% in Divisions A and B = $\frac{20,70,000}{90\%} \times 10\%$ | 2,30,000 | Avoidable Fixed Costs of Division "C" saved | 4,14,000 |
| Contribution of Division "C" lost | 2,41,500 | Net Cost of discontinuing Division "C" **(bal. fig.)** | **57,500** |
| **Total** | **4,71,500** | **Total** | **4,71,500** |

**Note:** Revenues and Fixed Costs of Divisions A and B are unaltered by the above decision, hence not relevant.

**2. Conclusion:** Discontinuing Division C involves a Net Cost as above, and is hence **not advisable.**

**Question 4(a): TOC – Bottleneck Identification and Resource Allocation** **8 Marks**

**Genex Limited produces 3 products X, Y and Z using three different Machines M1, M2 and M3. Each machine's capacity is limited to 6,000 hours for the production period. The details given below are for the production period:**

| Particulars | | X | Y | Z |
|---|---|---|---|---|
| Selling Price per unit | | ₹ 12,000 | ₹ 10,000 | ₹ 8,000 |
| Variable Cost per unit | | ₹ 8,000 | ₹ 6,800 | ₹ 6,000 |
| Machine Hours required per unit: | $M_1$ | 18 | 12 | 6 |
| | $M_2$ | 18 | 16 | 8 |
| | $M_3$ | 20 | 8 | 2 |
| Expected Demand (units) | | 200 | 200 | 200 |

(i) **Determine the Bottleneck Activity.**

(ii) **Allocate the Machine Hours on the basis of the Bottleneck.**

(iii) **Determine the Unused Spare Capacity, if any, of each Machine.**

**Solution:** **Similar to Page No.12.2, Illustration 1 – [M 09, M 13]**

**1. Identification of Bottleneck Activity**

| Machine | Time reqd for Products (Demand × Hrs p.u.) | | | Total Time reqd (Hrs) | Time Available (Hrs) | M/c Utilization = TA Ratio |
|---|---|---|---|---|---|---|
| | X | Y | Z | | | |
| | (a) | (b) | (c) | (d) = (a+b+c) | (e) = given | (f) = (d ÷ e) |
| M1 | 200 × 18 = 3,600 | 200×12= 2,400 | 200×6 = 1,200 | 7,200 | 6000 | 120% |
| M2 | 200 × 18 = 3,600 | 200×16= 3,200 | 200×8 = 1,600 | 8,400 | 6000 | 140% |
| M3 | 200 × 20 = 4,000 | 200× 8 = 1,600 | 200 × 2 = 400 | 6,000 | 6000 | 100% |

Since Machine M2 has the highest Machine Utilization (i.e. **TA Ratio**), it represents the **Bottleneck Activity**. Hence product, ranking & resource allocation should be based on Contribution per Machine Hour of Machine M2.

**2. Allocation of Resources**

| Particulars | X | Y | Z | Total |
|---|---|---|---|---|
| (a) Throughput Contribution p.u. | 12,000 – 8,000 = ₹ 4,000 | 10,000 – 6,800 = ₹ 3,200 | 8,000 – 6,000 = ₹ 2,000 | |
| (b) Time required in Machine M2 | 18 hours | 16 hours | 8 hours | |

| Particulars | X | Y | Z | Total |
|---|---|---|---|---|
| (c) Contribution per Machine–hour (a÷b) | ₹ 222.22 | ₹ 200 | ₹ 250 | |
| (d) Rank based on (c) above | **II** | **III** | **I** | |
| (e) Allocation of Machine M2 Time | (Max.) 3,600 | (bal. fig.) **800** | (Max.) 1,600 | 6,000 |
| (f) Production Quantity (e÷b) | (Max.) 200 units | 50 units | (Max.) 200 units | |
| (g) Allocation of Machine M1 time | (Max.) 3,600 hours | 50 ×12 = 600 hours | (Max.) 1,200 hours | 5,400 |
| (h) Allocation of Machine M3 time | (Max.) 4,000 hours | 50 × 8 = 400 hours | 400 hours | 4,800 |

**Note:** Spare Capacity: **Machine M1:** (6,000 – 5,400) = **600 Hours. Machine M3:** (6,000 – 4,800) = **200 Hours.**

**Question 4(b): Transportation – IBFS using different Methods** **8 Marks**

**Four students A, B , C and D were asked to work out the Initial Solution of the following matrix showing Unit Transportation Costs from Plants to Sales Outlets, with a Minimization Objective and Unbalanced Quantities of Supply and Demand. A introduced a Dummy Row D on top (above S1 position), while others introduced the Dummy Row D at the bottom (below S3 Position). A and B were asked to do the North West Corner Rule, while C did Least Cost Method and D did Vogel's Method.**

| Sales Outlets | Plant P1 | Plant P2 | Plant P3 | Demand |
|---|---|---|---|---|
| S1 | 9 | 27 | 18 | 80 |
| S2 | 12 | 12 | 18 | 120 |
| S3 | 24 | 10 | 15 | 140 |
| Supply | 120 | 150 | 90 | |

**Using the usual notation of Cell Reference (e.g. S2P3 refers to the Cell at the intersection of the S2 Row and P2 Column), what would be the 3rd allocation step in the initial allocation by each student?**

**You are advised to use the following format for your answers for Allocation Details at Step III.**
**(Candidates are not expected to show a fair version of the Transportation Matrix showing the calculations.)**

**Solution:** **Refer Illustrations in Chapter 17 Transportation on IBFS using different methods**

**Note:** Summary Workings for the above are as under –

**Student A: North West Corner Method**

| | P1 | P2 | P3 | Demand |
|---|---|---|---|---|
| **Dummy** | I:20 0 | 0 | 0 | 20/0 |
| **S1** | II:80 9 | 27 | 18 | 80/0 |
| **S2** | III:**20** 12 | 12 | 18 | 120 |
| **S3** | 24 | 10 | 15 | 140 |
| **Supply** | 120/100/20 | 150 | 90 | |

**Student B: North West Corner Method**

| | P1 | P2 | P3 | Demand |
|---|---|---|---|---|
| **S1** | I:80 9 | 27 | 18 | 80/0 |
| **S2** | II:40 12 | III:**80** 12 | 18 | 120/80 |
| **S3** | 24 | 10 | 15 | 140 |
| **Dummy** | 0 | 0 | 0 | 20/0 |
| **Supply** | 120/40/0 | 150 | 90 | |

**Student C: Least Cost Cell Method**

| | P1 | P2 | P3 | Demand |
|---|---|---|---|---|
| **S1** | II:80 9 | 27 | 18 | 80/0 |
| **S2** | 12 | 12 | 18 | 120 |
| **S3** | 24 | III:**140** 10 | 15 | 140 |
| **Dummy** | I:20 0 | 0 | 0 | 20/0 |
| **Supply** | 120/100/20 | 150 | 90 | |
| | | | | |

**Student D: Vogel's Method**

| | P1 | P2 | P3 | Demand | Cost Diff. |
|---|---|---|---|---|---|
| **S1** | II:80 9 | 27 | 18 | 80/0 | 9 **9** – |
| **S2** | III:**40** 12 | 12 | 18 | 120/80 | 0 0 0 |
| **S3** | 24 | 10 | 15 | 140 | 5 5 5 |
| **Dummy** | 0 | 0 | I:20 0 | 20/0 | 0 – – |
| **Supply** | 120/40 | 150 | 90/70 | | |
| **Cost.Diff** | 9/3/**12** | 10/2/2 | **15**/3/3 | | |

**Final Answer:** In the format indicated in the Question

| Student | Cell Reference | Quantity Allocated (units) | Unit Cost at that cell |
|---|---|---|---|
| A | S2P1 | 20 | 12 |
| B | S2P2 | 80 | 12 |
| C | S3P2 | 140 | 10 |
| D | S2P1 | 40 | 12 |

**Question 5(a): Activity Based Costing – OH Apportionment to Products** **8 Marks**

**Linex Limited manufactures three products P, Q and R which are similar in nature and are usually produced in Production Runs of 100 units. Product P and R require both Machine Hours and Assembly Hours, whereas Product Q requires only Machine Hours. The Overheads incurred by the Company during the first quarter are as under:**

| | |
|---|---|
| Machine Department Expenses | ₹ 18,48,000 |
| Assembly Department Expenses | ₹ 6,72,000 |
| Setup Costs | ₹ 90,000 |
| Stores Receiving Cost | ₹ 1,20,000 |
| Order Processing and Despatch | ₹ 1,80,000 |
| Inspection and Quality Control Cost | ₹ 36,000 |

**The data related to the three products during the period as under:**

| Particulars | P | Q | R |
|---|---|---|---|
| Units produced and sold | 15,000 | 12,000 | 18,000 |
| Machine Hours worked | 30,000 hrs | 48,000 hrs | 54,000 hrs |
| Assembly Hours worked (Direct Labour Hours) | 15,000 hrs | – | 27,000 hrs |
| Customer Orders executed (in Numbers) | 1,250 | 1,000 | 1,500 |
| Number of Requisitions raised on the Stores | 40 | 30 | 50 |

**Prepare a Statement showing details of Overhead Costs allocated to each product type using Activity Based Costing.**

**Solution:** **Refer Illustrations in Chapter 8 Activity Based Costing**

**Note:** Number of Batches =Number of Units ÷ 100 units per Batch. Ratio is the same for Units / Batches.

| Particulars | Ratios | P | Q | R | Total |
|---|---|---|---|---|---|
| Machine Department Exps | Machine hrs worked (30:48:54) | 4,20,000 | 6,72,000 | 7,56,000 | 18,48,000 |
| Assembly Department Exps | Assembly hrs worked (15:27) | 2,40,000 | Nil | 4,32,000 | 6,72,000 |
| Set up Costs | Number of Batches (150: 120: 180) | 30,000 | 24,000 | 36,000 | 90,000 |
| Stores Receiving Cost | Requisitions (40:30:50) | 40,000 | 30,000 | 50,000 | 1,20,000 |
| Order Processing & Despatch | Customer Orders (1250:1000:1500) | 60,000 | 48,000 | 72,000 | 1,80,000 |
| Inspection & Quality Control | Batches (or) Units (150: 120: 180) | 12,000 | 9,600 | 14,400 | 36,000 |
| **Total** | | **8,02,000** | **7,83,600** | **13,60,400** | **29,46,000** |

**Question 5(b): Simulation – Effect of Production Changes** **8 Marks**

**A Bakery bakes 100 Cakes per day. The sale of Cakes depends upon demand which has the following distribution:**

| Sale of Cakes | 97 | 98 | 99 | 100 | 102 | 103 |
|---|---|---|---|---|---|---|
| Probability | 0.10 | 0.15 | 0.20 | 0.35 | 0.15 | 0.05 |

**There is no carry over of inventory.**

**The following details are given:**

| | |
|---|---|
| Variable Production Cost per Cake | ₹ 14 |
| Selling Price per Cake | ₹ 18 |
| Penalty attracted per Unsold Cake | ₹ 3 |
| Penalty attracted per unit of Demand not met | ₹ 1 |

**Random Numbers to be used:** **9, 98, 64, 98, 94, 01, 78, 10, 15, 19**

**(i) Estimate the Profit/Loss for the next 10 days using above random nos. and assuming 100 Cakes are produced per day.**

**(ii) If the Bakery decides to produce 97 cakes per day, will be profits as per (i) above increase or decrease? Why?**

**Solution:** **Similar to Page No.21.7, Illustration 7 – [M 02]**

**1. Random Numbers Allocation Table for Sale of Cakes**

| **Sale of Cakes** | 97 | 98 | 99 | 100 | 102 | 103 |
|---|---|---|---|---|---|---|
| **Probability** | 0.10 | 0.15 | 0.20 | 0.35 | 0.15 | 0.05 |
| **Cumulative Probability** | 0.10 | 0.25 | 0.45 | 0.80 | 0.95 | 1.00 |
| **Random Numbers** | 00 – 09 | 10 – 24 | 25 – 44 | 45 – 79 | 80 – 94 | 95 – 99 |

**2. Simulation Table (for 100 Cakes produced per day) (₹)**

| **Trial /Day (a)** | **R. No (b)** | **Sales (Cakes) (c)** | **Prodn (Cakes) (d)** | **Revenue ₹ 18 per Cake (e) Note 1** | **Prodn Cost at ₹ 14/Cake (f) = (d)×14** | **Penalty for Unsold (g) Note 2** | **Demand not Met– Penalty (h) Note 3** | **Net Profit (i) = e–f–g–h** |
|---|---|---|---|---|---|---|---|---|
| 1 | 09 | 97 | 100 | 97×18= 1,746 | 1,400 | 3 × 3 =9 | Nil | 337 |
| 2 | 98 | 103 | 100 | 100×18= 1,800 | 1,400 | Nil | 3 × 1 = 3 | 397 |
| 3 | 64 | 100 | 100 | 100×18= 1,800 | 1,400 | Nil | Nil | 400 |
| 4 | 98 | 103 | 100 | 100×18= 1,800 | 1,400 | Nil | 3 × 1 = 3 | 397 |
| 5 | 94 | 102 | 100 | 100×18= 1,800 | 1,400 | Nil | 2 × 1 = 2 | 398 |
| 6 | 01 | 97 | 100 | 97×18= 1,746 | 1,400 | 3 × 3 =9 | Nil | 337 |
| 7 | 78 | 100 | 100 | 100×18= 1,800 | 1,400 | Nil | Nil | 400 |
| 8 | 10 | 98 | 100 | 98×18= 1,764 | 1,400 | 2 × 3 = 6 | Nil | 358 |
| 9 | 15 | 98 | 100 | 98×18= 1,764 | 1,400 | 2 × 3 = 6 | Nil | 358 |
| 10 | 19 | 98 | 100 | 98×18= 1,764 | 1,400 | 2 × 3 = 6 | Nil | 358 |
| **Total** | | **996 Units** | **1,000 Units** | For 988 Units **= ₹17,784** | 1,000 Units = **₹ 14,000** | **12 Units** | **8 Units** | **3,740** |

**3. Simulation Table (for 97 Cakes produced per day) (₹)**

| **Trial /Day (a)** | **R. No (b)** | **Sales (Cakes) (c)** | **Prodn (Cakes) (d)** | **Revenue ₹ 18 per Cake (e) Note 1** | **Prodn Cost at ₹ 14 / Cake (f) = (d) × 14** | **Penalty for Unsold Cake (g) Note 2** | **Demand not Met– Penalty (h) Note 3** | **Net Profit (i)= e-f–g–h** |
|---|---|---|---|---|---|---|---|---|
| 1 | 09 | 97 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | Nil | 388 |
| 2 | 98 | 103 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | 6 × 1 = 6 | 382 |
| 3 | 64 | 100 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | 3 × 1 = 3 | 385 |
| 4 | 98 | 103 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | 6 × 1 = 6 | 382 |
| 5 | 94 | 102 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | 5 × 1 = 5 | 383 |
| 6 | 01 | 97 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | Nil | 388 |
| 7 | 78 | 100 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | 3 × 1 = 3 | 385 |
| 8 | 10 | 98 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | 1 × 1 = 1 | 387 |
| 9 | 15 | 98 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | 1 × 1 = 1 | 387 |
| 10 | 19 | 98 | 97 | 97×18= 1,746 | 97×14 = 1,358 | Nil | 1 × 1 = 1 | 387 |
| **Total** | | **996 Units** | **970 units** | **970 Units = ₹17,460** | **970 Units = ₹13,580** | **Nil** | **26 Units** | **3,854** |

**Notes:** **1. Revenue** is computed on Production or Sales Quantity, whichever is **less**, at ₹ 18 per Cake.

**2. Penalty for Unsold Cake** arises only when Production > Sales, multiplied by ₹ 3 per Cake.

**3. Penalty** for Unmet Demand arises when Production < Sales, at ₹ 1 per Cake.

**4. Sale Quantity** = Production 1,000 – Unsold 12 = 988 (**or**) Demand 996 – Demand Not met 8 = **988 Units.**

**Result:** If 97 Cakes are produced per day, Profit increases by ₹ 114, explained as under –

| | | | |
|---|---|---|---|
| **Benefits:** | 1. Production Cost Avoided: | (1,000 – 970) = 30 Cakes ×14 = | 420 |
| | 2. Penalty on Unsold Cakes Avoided: | (12 – Nil) = 12 Cakes × 3 = | 36 |
| **Costs:** | 1. Loss of Sales Revenue: | (988 – 970) = 18 Cakes × 18 = | (324) |
| | 2.Penalty on Demand not met: | (26 – 8) = 18 Cakes × 1 = | (18) |
| | **Net Effect of the above** | | **114** |

**Question 6(a): Network Analysis** **8 Marks**

**A Project comprised of 10 activities whose Normal Time and Cost are given as follows:**

| Activity | 1–2 | 2–3 | 2–4 | 2–5 | 3–5 | 4–5 | 5–6 | 6–7 | 6–8 | 7–8 |
|---|---|---|---|---|---|---|---|---|---|---|
| Normal Time (Days) | 3 | 3 | 7 | 9 | 5 | 0 | 6 | 4 | 13 | 10 |
| Normal Cost (₹) | 800 | 100 | 900 | 1400 | 600 | 0 | 590 | 720 | 1490 | 1780 |

**Indirect Cost ₹ 115 per day.**

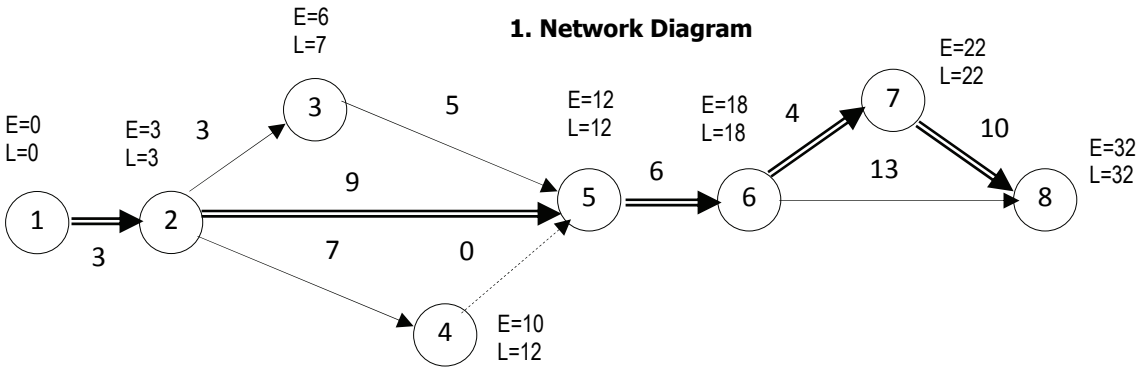
**(i) Draw the Network.**

**(ii) List all the Paths along with their corresponding durations and find the Critical Path.**

**(iii) When and at what cost will the Project be completed?**

**Solution:** **Similar to Page No.19.12, Illustration 2 [M 05]**

**1. Network Diagram**




**Notes:** Dummy Activity, i.e. where **Time & Cost = 0**, is denoted by Dotted Lines in the Network.
**"E" and "L"** Computations (Occurrence Times) are shown only for Students' Reference, and not required as such.
Critical Path is indicated in **thick lines**, after identification thereof from WN 3 below.

**2. Paths Table**

| Path | Duration (days) |
|---|---|
| 1 – 2 – 3 – 5 – 6 – 7 – 8 | 3 + 3 + 5 + 6 + 4 + 10 = 31 |
| 1 – 2 – 3 – 5 – 6 – 8 | 3 + 3 + 5 + 6 + 13 = 30 |
| 1 – 2 – 5 – 6 – 7 – 8 | 3 + 9 + 6 + 4 + 10 = 32 |
| 1 – 2 – 5 – 6 – 8 | 3 + 9 + 6 + 13 = 31 |
| 1 – 2 – 4 – 5 – 6 – 7 – 8 | 3 + 7 + 0 + 6 + 4 + 10 = 30 |
| 1 – 2 – 4 – 5 – 6 – 8 | 3 + 7 + 0 + 6 + 13 = 29 |

**3. Relevant Computations**

(a) Critical Path = Longest Path as per WN 2 = 32 days = **1 – 2 – 5 – 6 – 7 – 8.**

(b) Time of Completion = Critical Path Duration = **32 days.**

(c) Cost of Completion = Normal Cost (of all Activities) + Indirect Cost at ₹ 115 per day
= (800+100+900+1400+600+590+720+1,490+1,780) + (32 days × ₹ 115) = **₹ 12,060**

**Question 6(b): Material Cost Variances** **8 Marks**

**The Standard Cost of certain chemical mixture is as under:**

**40% of Material A @ ₹ 30 per kg, 60% of Material B @ ₹ 40 per kg**

**A Standard Loss of 10% of Input is expected in production. The following actual cost data is given for the period.**

- **350 kg Material–A at a cost of ₹ 25, 400 kg Material–B at a cost of ₹ 45**
- **Actual weight produced is 630 kg.**

**Calculate the following variances Raw Materials wise and indicate whether they are Favourable (F) or Adverse (A):**

**(1) Cost Variance, (2) Price Variance, (3) Mix Variance, and (4) Yield Variance.**

**Solution:** **Similar to Page No.1.18, Q.No.1 [M 12]**

**1. Computation of Standard Quantity (SQ)**

Yield = 100% – 10% Loss = 90%.

Since Actual Output is 630 kg, SQ = $\frac{630\ Kg}{90\%}$ = 700 kg

| Material Std Mix | A 40% | B 60% |
|---|---|---|
| Std Quantity | 280 kg | 420 kg |

**2. Computation of Revised Actual Quantity (RAQ)**

Total AQ = 350 + 400 = 750 kg RM

| Material | A | B |
|---|---|---|
| Standard Mix | 40% | 60% |
| RAQ | 300 kg | 450 kg |

**3. Variance Computation Chart**

| Particulars | Col.(1): SQ × SP | Col.(2): RAQ × SP | Col.(3): AQ × SP | Col.(4): AQ × AP |
|---|---|---|---|---|
| Material A | 280 × ₹ 30 = 8,400 | 300 × ₹ 30 = 9,000 | 350 × ₹ 30 = 10,500 | 350 × ₹ 25 = 8,750 |
| Material B | 420 × ₹ 40 = 16,800 | 450 × ₹ 40 = 18,000 | 400 × ₹ 40 = 16,000 | 400 × ₹ 45 = 18,000 |
| **Total** | **(WN 1) ₹ 25,200** | **(WN 2) ₹ 27,000** | **₹ 26,500** | **₹ 26,750** |

Material **Yield** Variance = Col.(1) – Col.(2)
**Matl.A:** 8,400–9,000 = **600 A**
**Matl.B:** 16,800–18,000 = **1,200 A**
**Total = ₹ 1,800 A**

+ Material **Mix** Variance =Col.(2) – Col.(3)
**A:** 9,000–10,500 = **1,500 A**
**B:** 18,000–16,000 = **2,000 F**
Total = **₹ 500 F**

+ Material **Price** Variance =Col.(3) – Col.(4)
**A:** 10,500–8,750= **1,750 F**
**B:** 16,000–18,000= **2,000 A**
Total = **₹ 250 A**

**Total Material Cost Variance**
**= Col.(1) – Col.(4)** [or] **Yield + Mix + Price Var.**
**A:** 8,400–8,750 = **350 A**
**B:** 16,800–18,000 = **1,200 A**
Total = **₹ 1,550 A**

**Note:** Material–wise Breakup of Variances are shown in the above Chart itself.
Material Usage Variance is not shown separately, since it is not required in the Question.

**Question 7(a): Quality Dimensions** **4 Marks**

**Quality Products can be determined by using a few of the dimensions of quality. Identify the following under the appropriate Dimension:**

| Aspect | Quality Dimension |
|---|---|
| (i) Consistency of performance over time | **Reliability** |
| (ii) Primary Product Characteristics | **Performance** |
| (iii) Exterior Finish of a Product | **Features** |
| (iv) Useful Life of a Product | **Durability** |

**Note:** Some dimensions of Quality under TQM are given below for reference – (**Note:** Alternative views are available.)

| Dimension | Description |
|---|---|
| 1. Performance | Performance refers to a product's primary operating characteristics. This dimension of quality involves measurable attributes; brands can usually be ranked objectively on individual aspects of performance. |
| 2. Features | Features are additional characteristics that enhance the appeal of the product or service to the User. |
| 3. Reliability | Reliability is the likelihood that a product will not fail within a specific time period. This is a key element for Users who need the product to work without fail. |
| 4. Conformance | Conformance is the precision with which the product or service meets the specified standards. |
| 5. Durability | Durability measures the length of a product's life. When the product can be repaired, estimating durability is more complicated. The item will be used until it is no longer economical to operate it. This happens when the repair rate and the associated costs increase significantly. |
| 6. Serviceability | Serviceability is the speed with which the product can be put into service when it breaks down, as well as the competence and the behaviour of the Serviceperson. |
| 7. Aesthetics | Aesthetics is the subjective dimension indicating the kind of response a user has to a product. It represents the individual's personal preference. |
| 8. Response | This involves aspects like Human–to–Human Interface, e.g. Courtesy of the Dealer. |

| Dimension | Description |
|---|---|
| 9. Perceived Quality | Perceived Quality is the quality attributed to a good or service based on indirect measures. |

**Question 7(b): Balanced Score Card – Perspectives** **4 Marks**

**In the context of a Balanced Score Card, identify the perspective of the following independent situations:**
**(Candidates need to only write the 1st and Last Columns (i.e. Perspective) in the Answer Books.)**

| | Organization | Target Parameter | Perspective | Concept |
|---|---|---|---|---|
| (i) | Courier Company | 100% on–time delivery of priority Despatches. | **Internal Business Perspective Alternative:** Customer Perspective | Efficiency of Process<br>Alternative: Quality |
| (ii) | Tuition Centre | Set up Class–on–Internet facility for better reach of more number of Students and Absentees. | **Innovation & Learning Perspective** | Technology Leadership |
| (iii) | Computer Manufac–turing Company | Set up Service Centres is all major cities for After Sales Support. | **Customer Perspective** | Quality / Support |
| (iv) | Government Taxation Department | Ensure Computer Training to all officers above a certain Rank, to improve their capabilities. | **Internal Business Perspective** | Efficiency of Process |

**Note:** Answer is given in Perspective Column above. For clarifying the concept, the Last Column is added.

**Refer Page No.14.13, Q.No.11**

**Question 7(c): Value Chain Analysis – Classification of Activities** **4 Marks**

**Classify the following business activities into primary and support activities under Value Chain Analysis:**

| Business Activity | Nature of Activity | Reference |
|---|---|---|
| (i) Material Handling and Warehousing. | **Primary Activity** | **Page No.14.1, Q.No.3** |
| (ii) Purchasing of Raw Materials, Supplies and other Consumables. | **Support Activity** | **Page No.14.1, Q.No.3** |
| (iii) Order Processing and Distribution. | **Primary Activity** | **Page No.14.1, Q.No.3** |
| (iv) Selection, Placement and Promotion of Employees. | **Support Activity** | **Page No.14.1, Q.No.3** |

**Question 7(d): Pareto Analysis** **4 Marks**

**What are the applications of Pareto Analysis in Customer Profitability Analysis?**

**Solution:** **Refer Page No. 3.13, Q.No.36 [RTP, N 03, N 05, M 08]**

**Question 7(e): Learning Curve – Applicability** **4 Marks**

**State whether and why the following are valid or not for Learning Curve Theory:**

| Question / Description | Validity | Reasoning / Reference |
|---|---|---|
| (i) Learning Curve Theory applies to a Division of a Company which is fully automated. | **Valid** | Learning Curve applies only to labour operations. It will not apply to fully automated activities. **[Page 20.1, Q.1]** |
| (ii) Learning Curve Theory helps in setting standards. | **Valid** | **Page No.20.1, Q.No.4, Point 6** |
| (iii) Learning Curve helps in Pricing Decisions. | **Valid** | **Page No.20.1, Q.No.4, Point 3** |
| (iv) Experienced Workmen are more prone to Learning Effect. | **Invalid** | Activities performed by already experienced workmen are not subject to learning effect. **[Page No.20.1, Q.No.1]** |