Gurukripa's Guideline Answers to May 2016 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 Ready Referencer on Advanced Management Accounting"**

Question 1(a): Target Costing — 5 Marks

UK Ltd prepared a Draft Budget for the next year as follows:

Quantity	10,000 units
	₹
Selling Price per Unit	60
Variable Cost per Unit	
– Direct Materials	16
– Direct Labour (2 hours × ₹ 6)	12
– Variable Overheads (2 hrs ₹ 1)	2
Contribution per Unit	30
Total Budgeted Contribution	3,00,000
Less: Total Budgeted Fixed Overheads	2,80,000
Total Budgeted Profit	20,000

The Board of Directors are not satisfied with this Draft Budget and suggested the following changes for the better profit:

(i) The Budgeted Profit is ₹ 50,000,

(ii) The Company should spend ₹ 57,000 on advertisement and the Target Sales Price up to ₹ 64 per unit.

(iii) It is expected that the Sales Volume will also rise, inspite of the price rise, to 12,000 units.

In order to achieve the extra Production Capacity, however, the work force must be able to reduce the time taken to make each unit of the product. It is proposed to offer a pay and productivity deal in which the wages rate per hour is increased to ₹ 8. The hourly rate for Variable Overheads will be unaffected.

You are required to calculate the target labour time require to achieve the Target Profit.

Solution: **Similar to M 91 Qn**

1. Target Contribution Per Unit = $\frac{\text{Fixed Cost} + \text{Target Profit}}{\text{Sale Quantity}} = \frac{(2,80,000 + 57,000) + 50,000}{12,000 \text{ Units}}$ = **₹ 32.25 Per Unit**

2. Target Variable Cost Per Unit = New sale Price – Target Contribution pu = ₹ 64 – ₹ 32.25 = **₹ 31.75 Per Unit**

3. Direct Materials + Direct Labour + VOH = ₹ 16+ (H × ₹ 8) + (H × ₹ 1) = ₹ 31.75
   Solving, we have 9H = 15.75. So, H = $\frac{15.75}{9}$ = **1.75 Hours**

Question 1(b): Total Quality Management — 5 Marks

Supreme Prakashan Ltd is in the business of publishing a leading newspaper which has a wide customer base. It measures quality of service in terms of –

(i) Print Quantity

(ii) On time Delivery

(iii) Number of Damaged and Unsold Papers.

To improve its business prospects and performance, the Company is considering installing a scheduling and tracking system which involve an annual additional cost of ₹ 3,00,000, beside Equipments costing ₹ 4,00,000 needed for the installation of System.

To purchase the Equipment, the Company is planning to utilize the proceeds of an Investment fetching an Annual Income of 9%. Details, regarding the present and future performance are given as under:–

	Present	Expected
On–Time Delivery	85%	97%
Variable Cost per lot of Newspaper Damaged and Unsold	₹ 40	₹ 40
Fixed Cost	₹ 50,000	₹ 50,000
No. of lots of Newspaper Damaged and Unsold	6,000	1,000

It is expected that each percentage increase in on time performance will result in Revenue Increase of ₹ 36,000 per annum. Required Contribution Margin is 40%.

Should Supreme Prakashan Ltd install the New System?

Solution: **Similar to Page 11.11, Q.No.4 [N 03]**

Relevant Costs	₹	Relevant Benefits	₹
Annual Costs of new system (given)	3,00,000	Contribution Earned (₹ 36,000 × 12 times × 40%)	1,72,800
Income lost on Capital Investment (₹ 4,00,000×9%)	36,000	Savings in Variable Costs:	
Fixed Costs (Apportionment, and not relevant)	Nil	(6,000 – 1,000) × ₹ 40	2,00,000
Net Benefit (balancing figure)	**36,800**		
Total	**3,72,800**	**Total**	**3,72,800**

Decision: The new system may be implemented.

Question 1(c): Service Sector Costing – Conveyance Facilities 5 Marks

A Company is considering three alternative proposals for conveyance facilities for its Sales Personnel who, have to do considerable travelling, approximately 20,000 kilometres every year. The proposals are as follows:

(i) Purchase and maintain its own fleet of Cars. The average cost of a Car is ₹ 1,00,000.

(ii) Allow the Executive to use his own Car and reimburse expenses at the rate of ₹ 1.60 per kilometer, and also bear Insurance Costs.

(iii) Hire Cars from an Agency at ₹ 20,000 per year per Car. The Company will have to bear costs of Petrol, Taxes and Tyres.

The following further details are available:

- Petrol ₹ 0.60 per km
- Repairs and Maintenance ₹ 0.20 per km
- Tyres ₹ 0.12 per km
- Insurance ₹ 1,200 per Car per annum
- Taxes ₹ 800 per Car per annum
- Life of the car: 5 years with Annual Mileage of 20,000 kms
- Resale Value: ₹ 20,000 at the end of the fifth year.

Work out the relevant costs of three proposals and rank them.

Solution: **Refer Similar Illustrations in Chapter 6 – Past Exam Qn**

Computation of Operating Cost per Km

Particulars	Computations	Option (i)	Option (ii)	Option (iii)
(i) Petrol	Given	₹ 0.60	–	₹ 0.60
(ii) Depreciation	$\frac{₹ 1,00,000 - ₹ 20,000}{5 \text{ Years} \times 20,000 \text{ Km}}$	₹ 0.80	–	–

Particulars	Computations	Option (i)	Option (ii)	Option (iii)
(iii) Reimbursement	Given	–	₹ 1.60	–
(iv) Hire Charges	₹ 20,000 / 20,000 Km	–	–	₹ 1.00
(v) Repairs and Maintenance	Given	₹ 0.20	–	–
(vi) Tyres	Given	₹ 0.12	–	₹ 0.12
(vii) Insurance	₹ 1,200 / 20,000 Km	₹ 0.06	₹ 0.06	–
(viii)Taxes	₹ 800 / 20,000 Km	₹ 0.04	–	₹ 0.04
Total		₹ 1.82	**₹ 1.66**	₹ 1.76
Rank		III	**I**	II

Question 1(d): Transportation – Multiple Optimal Solution 5 Marks

The Cost per unit of transporting goods from the Factories X, Y and Z to Destinations A, B, C and D, and the quantities demanded and supplied are given:

Factories	Destinations				Supply
	A	B	C	D	
X	25	50	20	24	100
Y	30	40	35	10	250
Z	20	10	25	35	200
Demand	250	100	150	50	550

Answer the following question with reasons, taking u_3 as zero while calculating u_i & v_j :

(i) Is this solution is optimum?

(ii) If yes, can there be any alternate optimum solution?

Solution: **Similar to Page 17.11, Q.No.5 and Page 17.12, Q.No.6 [N 90, N 99]**

Particulars	A	B	C	D	Amount	Cost Differences I	II	III	IV
X	25	50	**100** 20	25	100/0	5	5	5	–
Y	**150** 30	40	**50** 35	**50** 10	250/200/0	20	**20**	5	5
Z	**100** 20	**100** 10	25	35	200/100/0	10	5	5	5
Required	200/150/0	100/0	150/50/0	50/0	550				

Cost Diff:				
I	5	**30**	5	15
II	5	–	5	15
III	5	–	**5**	–
IV	**10**	–	10	–

In the above IBFS, Number of allocated cells is 6.
m + n – 1 (i.e. Rows + Columns – 1)
= 3 + 4 – 1 = 6. Hence, there is no degeneracy.
This can be tested for optimality.

OPTIMALITY TEST: **Table 1 = U + V for allocated cells computed as below:**

U & V	20 – 0 = 20	10 – 0 = 10	35 – 10 = 25	10 – 10 = 0
20 – 25 = –5	25	50	**100** 20	25
30 – 20 = 10	**150** 30	40	**50** 35	**50** 10
(Base) 0	**100** 20	**100** 10	25	35

Table 2 = U + V for Unallocated Cells

20+(–5) = 15	10+(–5) = 5		0+(–5) = –5
	10+10 = 20		
		25 –0 = 25	0 – 0 = 0

Table 3 = Net Evaluation Table (NET)
= Table 1 – Table 2 for Unallocated Cells

25 – 15 = 10	50 – 5 = 45		25–(–5)=30
	40–20 = 20		
	6 – 5 = 1	25–25=0	35–0 = 35

Conclusion: Since, all NET Entries are ≥ 0, the solution is **Optimal, but not unique**. As many Zeroes, that many Alternative Optimal Solutions are possible. Hence, in this case there is **1 alternative Optimal Solution** (1 Zero in ZC cell).

Question 2(a): Total Quality Management 8 Marks

A Company produces and sells a single product. The Cost Data per unit for the year 2017 is predicted as below:

	₹ per unit		₹ per unit
Direct Material	35	Variable Overheads	15
Direct Labour	25	Selling Price	90

The Company has forecast that demand for the product during the year 2017 will be 28,000 units. However, to satisfy this level of demand, Production Quantity will be increased.

There are no Opening Stock and Closing Stock of the Product.

The Stock Level of Material remains unchanged throughout the Period.

The following additional information regarding Costs and Revenue are given:

- 12.5% of the items delivered to Customers will be rejected due to Specification Failure, and will require free replacement. The Cost of delivering the replacement item is ₹ 5 per unit.
- 20% of the items produced will be discovered faulty at the Inspection Stage before they are delivered to customers.
- 10% of the Direct Material will be scrapped due to damage while in storage.

Due to above, Total Quality Costs for the year is expected to be ₹ 10,75,556.

The Company is now considering the following proposal:

1. To introduce Training Programmes for the workers which, the Management of the Company believes, will reduce the level of faulty production to 10%. This Training Programme will cost ₹ 4,50,000 per annum.
2. To avail the services of Quality Control Consultant, at an annual charges of ₹ 50,000, which would reduce the percentage of faulty items delivered to customers to 9.5%.

You are required to:

(i) Prepare a statement of expected Quality Costs the Company would incur if it accepts the proposal. Costs are to be calculated using the four recognized Quality Costs Heads.

(ii) Would you recommend the proposal? Give Financial and Non–Financial Reasons.

Solution: **Similar to Page 11.13, Q.No.6 [RTP, M 05]**

1. Computation of Finished Goods Production Quantity (in units)

		Before TQM	After TQM
	Sales Quantity	28,000	28,000
Add:	Additional Quantity towards Specification Failure	$28{,}000 \times \frac{12.5\%}{87.5\%} = 4{,}000$	$28{,}000 \times \frac{9.5\%}{90.5\%} = 2{,}939$
	Total of the above	32,000	30,939
Add:	Additional Quantity towards Faulty Inspection	$32{,}000 \times \frac{20}{80} = 8{,}000$	$30{,}939 \times \frac{10}{90} = 3{,}438$
	Total FG Quantity to be produced before Inspection	40,000	34,377

2. Material Costs (in ₹)

		Before TQM	After TQM
	RM Costs for producing Pre–Inspection FG Quantity	40,000 × ₹ 35 = 14,00,000	34,377 × ₹ 35 = 12,03,195
Add:	Scrapping at Storage Stage	$14{,}00{,}000 \times \frac{10}{90} = 1{,}55{,}556$	$12{,}03{,}195 \times \frac{10}{90} = 1{,}33{,}688$
	Total	**15,55,556**	**13,36,883**

3. Cost Comparison (**Note:** VC pu = 35+25+15 = ₹ 75) **(in ₹)**

COQ Category	Before TQM	After TQM	Savings / (Addl)
A. Quality Compliance Costs			
1. Prevention			
(a) Consultant to reduce Spec.Failure	–	50,000	(50,000)
(b) Training to reduce Faulty Prodn	–	4,50,000	(4,50,000)
2. Appraisal	–	–	–
B. Quality Non – Compliance Costs			
1. Internal Failure:			
(a) Material Scrap at Storage	1,55,556	1,33,688	21,868
(b) Faulty Production (Pre–delivery)	8,000 × ₹ 75 = 6,00,000	3,438 × ₹ 75 = 2,57,850	3,42,150
2. **External Failure:** Specification Failure			
(a) Production Cost of Extra Units	4,000 × ₹ 75 = 3,00,000	2,939 × ₹ 75 = 2,20,425	79,575
(b) Delivery Costs	4,000 × ₹ 5 = 20,000	2,939 × ₹ 5 = 14,695	5,305
Total	**10,75,556**	**11,26,658**	**(51,102)**

Conclusion:

(a) There is an Additional COQ of ₹ **51,102**. Hence, considering financial reasons alone, TQM proposal is **not** worthwhile.

(b) Proposed Sale Revenue = ₹ 90 × 28,000 = ₹ 25,20,000. Additional COQ = $\frac{51,102}{25,20,000}$ = only 2.03% of Sale Revenue.

(c) Hence, considering Materiality, and Non–Financial Factors (viz. long run impact on Profits, better market image due to the quality of supply, future increase in Sales, etc.), the TQM Proposal may be implemented.

Note: The Company may also identify measures to reduce Material Scrapping Costs, to implement better cost management.

Question 2(b): Pricing 8 Marks

A Company manufactures a product Y in addition to other products, by using the same machines in Department A and Department B.

The usage details are:–

Per unit of Product Y	Department A		Department B	
	Usage	Rate	Usage	Rate
Direct Material	8 kg	₹ 4	4 kg	₹ 6
Direct Labour	2 hours	₹ 14	3 hours	₹ 12

Basis of Overhead recovery are given below:

Per unit of Product Y	Department A per rupee of Direct Material	Department B per Direct Labour Hour
Variable Overheads	₹ 0.80	₹ 2.00
Fixed Overheads	₹ 2.20	₹ 3.00

Other details are:

- Value of Plant & Machinery in Department A is ₹ 22 Lakhs and in Department B is ₹ 18 Lakhs.
- The Working Capital Requirement of Product Y based on a Target Volume of output of 2,000 units per month is estimated at ₹ 2,72,800 per annum which is 40% of the potential capacity.

Required:

(i) Calculate the Selling Price of Product Y, to ensure contribution equivalent to 25% of Investment made.

(ii) If Product Y is a new product about to be launched in the market, on what basis should the price be Fixed and what would be the minimum price?

(iii) If product Y is a well established product, what should be the basis for price fixing and what would be the minimum price?

Solution: **Similar to Page 3.23, Q.No.12 [N 09]**

1. Computation of Required Sale Price per unit

Particulars	Computation	₹
(a) Share of Investment in Plant and Machinery	40% of (₹ 22 Lakhs + ₹ 18 Lakhs)	16,00,000
(b) Investment in Working Capital		2,72,800
(c) **Total Investment**	Assumed 40% of FA Capacity is for this Product	**18,72,800**
(d) Required ROI= 25%. So, Required EBT	25% on ₹ 18,72,800	4,68,200
(e) Required EBT per unit per month	(₹ 4,68,200 ÷ 12 months) ÷ 2,000 units	19.51
(f) Material Cost p.u.	Dept A: 8 Kg × ₹ 4 + Dept. B: 4 Kg × ₹ 6	56.00
(g) Labour Cost p.u.	Dept A: 2 hrs × ₹ 14 + Dept. B: 3 hrs × ₹ 12	64.00
(h) VOH p.u.	(Dept A: 8 kg × ₹4 × ₹ 0.80) + (Dept. B: ₹ 2 ph × 3 hrs)	31.60
(i) FOH p.u.	(Dept A: 8 kg × ₹4 × ₹ 2.20) + (Dept. B: ₹ 3 ph × 3 hrs)	79.40
(j) **Required Sale Price p.u.** (Total of e to i)		**250.51**

Note: Alternatively, FOH of ₹ 79.40 p.u. can also be excluded, since other products are also produced using same Plant & Machinery.

2. Computation of Sale Price

(a) If the product is **well established in the market**, the minimum sale price can range from –		(b) If product is **launched for the first time** in the market, the minimum sale price can range from –	
Total Cost (Total of f to i)	= ₹ 231.00	Variable Cost (Total of f to h)	= ₹ 151.60
Total Cost + Profit Margin (Total of e to i)	= ₹ 250.51	Total Cost (Total of f to i)	= ₹ 231.00
So, Price Range **= ₹ 231.00 to ₹ 250.51**		So, Price Range = **₹ 151.60 to ₹ 231.00**	

Question 3(a): Transfer Pricing – Evaluation of Proposal 8 Marks

Division X and Y are two divisions of XY Ltd, which operate as Profit Centres. Division X makes and sells Product X. The Budgeted Income Statement of Division X, based on a sales volume of 30,000 units, is given below:

Particulars	₹ in '000
Sales Revenue	6,000
Component Purchases Costs	1,050
Other Variable Costs	1,680
Fixed Costs	480
Variable Marketing Costs	270
Fixed Marketing Overheads	855
Operating Profit	1,665

The Manager of Division X suggests that sales can be increased by 9,600 units, if the Selling Price is reduced by ₹ 20 per unit from the present price of ₹ 200 per unit, and that for this additional volume, no additional Fixed Costs will be incurred.

Division Y makes a Component Y, which is sold outside at a price of ₹ 50 per unit.

Division X presently uses a component which is purchased from outside at ₹ 35 per unit. This component is similar to the component made by Division Y. Division Y can make this component for Division X with a minor modification in specification which would cause reduction in Direct Material Cost for the Division Y by ₹ 1.5 per unit, and would require extra labour hour of 1 per unit at the rate of ₹ 1.5 per hour.

Further, Division Y will not incur Variable Selling Marketing Cost on units transferred to the Division X. Division X's Manager has offered to buy the component from Division Y at ₹ 25.00 per unit.

Division Y has the Capacity to produce 85,000 units.

The Current budgeted Information of Division Y are as follows:
Number of units sold outside 60,000 units @ ₹ 50 per unit, Variable Cost including Material and Labour ₹ 15 per unit, Variable Marketing Cost ₹ 3 per unit, Operating Profit ₹ 12,00,000 and Fixed Overheads ₹ 7,20,000.

Advise:

(i) Should the Division X reduce the Selling Price by ₹ 20 per unit, even if it is not able to procure the component from Division Y at ₹ 25 per unit?

(ii) Should the Division Y be willing to supply 39,600 units to Division X at ₹ 25 per unit?

Support each of your conclusions with appropriate calculations.

Solution: **Refer Similar Illustrations in Chapter 5**

1. Cost Analysis

A. Division X	
• Variable Cost Per Unit	
(a) Component	$\frac{1,050}{30}$ =₹ 35
(b) Other Production Costs	$\frac{1,680}{30}$ =₹ 56
(c) Marketing	$\frac{270}{30}$ =₹ 09
Total Variable Cost p.u.	₹ **100**
• Fixed Costs [4,80,000+8,55,000]	₹ 13,35,000

B. Division Y		
• Variable Cost Per Unit	Production	Marketing
(a) For External Sales	₹ 15	₹ 3
(b) For Int. Transfer [15+1.5–1.5]	₹ 15	Nil
• Fixed Costs (Given)	₹ 7,20,000	

2. Effect of Price reduction by X

Additional Contribution from Price Reduction by Division X

= Proposed Contribution (–) Present Contribution

= [39,600 Units×₹ (SP 200– Reduction 20–VC 100)] (–) [30,000 Units × ₹ (SP 200– VC 100)]

= ₹ 31,68,000 – ₹ 30,00,000 = **₹ 1,68,000**

Hence, the Price Reduction proposal is **worthwhile**, even if component is bought from outside.

Note: It is assumed that the Reduced Price applies to all 39,600 Units, and not only the additional 9,600 Units.

3. Effect of Internal Transfer at ₹ 25 by Division Y

Particulars	**Present**	**Proposed**	
Output	60,000 units (Capacity: 85,000 Units)	85,000 Units	
	External Sale	**Sale**	**Transfer**
Revenue Per Unit	₹ 50	₹ 50	₹ 25
Less: Variable Cost Per Unit **[WN 1B]**	15+3 = ₹ 18	₹ 18	₹ 15
Contribution Per Unit	₹ 32	₹ 32	₹ 10
		₹ 14,52,800	₹ 3,96,000
Total Contribution (Qtty × Cn pu)	**₹ 19,20,000**	**₹ 18,48,800**	

Observation: Division Y may not be interested in supplying 39,600 Units to X at ₹ 25 p.u. due to reduction in Contribution.

Question 3(b): Budgeting – Production, Material usage & EOQ 8 Marks

A Company is engaged in manufacturing two products M and N. Product M uses one unit of Component P and two units of Component Q. Product N uses two units of Component P, one unit of Component Q and two units of Component R. Component R, which is assembled in the Factory, uses one unit of Component Q. Components P and Q are purchased from the market. The Company has prepared the following forecast of Sales and Inventory for the next year:

	Product M	Product N
Sales (in units)	80,000	1,50,000
At the end of the year	10,000	20,000
At the beginning of the year	30,000	50,000

The production of both the products and the assembling of the Component R will be spread out uniformly throughout the year. The Company at present orders its inventory of P and Q in quantities equivalent to 3 months production. The Company has compiled the following data related to two components:

	P	Q
Price per unit (₹)	20	8
Order Placing Cost per order (₹)	1,500	1,500
Carrying Cost per annum	20%	20%

Required:
(i) Prepare a Budget of Production and Requirements of Components for next year.
(ii) Suggest the Optimal Order Quantity of Components P and Q.

Solution: **Similar to Page 7.10, Q.No.2 [M 06 (Modified), M 10 (Modified), M 13]**

1. Computation of Budgeted Production Quantities

Particulars		Product M	Product N
	Budgeted Sales	80,000	1,50,000
Add:	Stock at the end of the year	10,000	20,000
	Sub – Total	90,000	1,70,000
Less:	Stock at the beginning of the year	30,000	50,000
	Budgeted Production Quantity	**60,000**	**1,20,000**

2. Computation of Budgeted Component Requirements and EOQ

Particulars	Material P	Material Q	Material R
Product M: 60,000 units	1 × 60,000 = 60,000	2 × 60,000 = 1,20,000	NA
Product N: 1,20,000 units	2 × 1,20,000 = 2,40,000	1 × 1,20,000 = 1,20,000 +(for making R) 2,40,000 × 1=2,40,000	2 × 1,20,000 = 2,40,000 (to be made internally)
Total Requirement p.a.	**3,00,000 units**	**4,80,000 units**	**(already considered in Q)**
Buying Cost per Order	₹ 1,500	₹ 1,500	
Carrying Cost p.u. p.a.	20% of ₹ 20 = ₹ 4.00	20% of ₹8 = ₹1.6	
EOQ $= \sqrt{\frac{2AB}{C}}$	**15,000 units**	**30,000 units**	

Question 4(a): Standard Costing – Reverse Working 8 Marks

A Company operates a Standard Cost System to control the Variable Works Cost of its only product. The following are the details of actual production, Costs and Variances for November 2015.

Production Costs – Actuals – for 10,000 units:		Cost Variances:	
1. Direct Materials:	1,05,000 kgs at a cost of ₹ 5,20,000	1. Materials	Price: ₹ 5,000F, Usage: ₹ 25,000A
2. Direct Labour:	19,500 hours at a cost of ₹ 3,08,000	2. Labour	Rate: ₹ 15,500A, Efficiency: ₹7,500F
3. Variable Overheads:	₹ 4,10,000	3. Variable Overheads: ₹ 10,000A	

The Cost Accountant finds that the Original Standard Cost Data for the product is missing from the Cost Department Files. The Variance analysis for December, 2015 is held up for want of this data.

Calculate – (i) Standard Price per kg of Direct Material; (ii) Standard Quantity for each Unit of Output; (iii) Standard Rate of Direct Labour hour; (iv) Standard Time for Actual Production; (v) Standard Variable Overhead Rate.

Solution: **Same Question in Page 1.78, Illustration 48 [RTP]**

1. Materials Variances

Col. (1): Std Cost = SQ × SP	Col. (2): AQ × SP	Col. (3): AQ × AP
SQ = bal.fig, SP from Col.2 **1,00,000 kg** × ₹ 5 = ₹ 5,00,000 (i.e. Col.2 ₹ 5,25,000 **less** MUV ₹ 25,000 A)	AQ = given, SP = bal. fig. 1,05,000 kg × ₹ **5** = ₹ 5,25,000 (i.e. Actual Cost ₹ 5,20,000 **+** MPV ₹ 5,000 F)	AQ = given, AP = bal.fig 1,05,000 kg × ₹ **4.95** = ₹ 5,20,000 (Given)

Material **Usage** Variance = ₹ 25,000 A (given) + Material **Price** Variance = ₹ 5,000 F (given)

Total Material Cost Variance (given) = ₹ 25,000 A + ₹ 5,000 F = ₹ 20,000 A

Note: Since SQ of RM for 10,000 units of FG = 1,00,000 kg, it means that 1 unit of FG requires 10 kg of RM.

2. Labour Variances

Col. (1): Std Cost = SH × SR	Col. (2): AH × SR	Col. (3): AH × AR
SH = bal. fig, SR from Col.2 **20,000 hrs** × ₹ 15 = ₹ 3,00,000 (i.e. Col.2 ₹ 2,92,500 **+** LEV ₹ 7,500 F)	AH = given, SR = bal. fig. 19,500 hours × ₹ **15** = ₹ 2,92,500 (i.e. Actual Cost ₹ 3,08,000 **less** LRV ₹ 15,500 A)	AH = given, AR = bal. fig. 19,500 hours× ₹ **15.79** = ₹ 3,08,000 (Given)

Labour **Efficiency** Variance = ₹ 7,500 F (given) + Labour **Rate** Variance = ₹ 15,500 A (given)

Total Labour Cost Variance (given) = ₹ 7,500 F + ₹ 15,500 A = ₹ 8,000 A

Note: Since SH of Labour for 10,000 units of FG = 20,000 hours, it means that 1 unit of FG requires 2 Direct Labour Hours.

3. VOH Variances

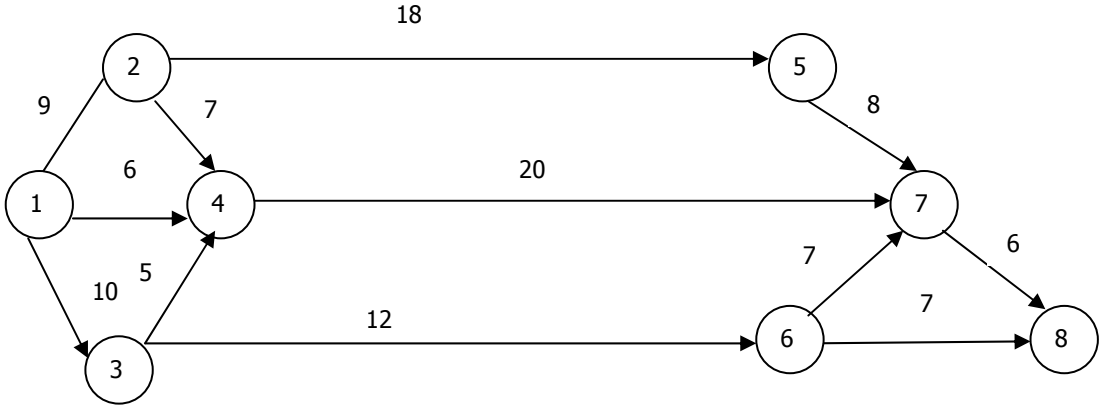
Col. (1): Std Cost = SH × SR	Col. (2): AH × SR	Col. (3): AH × AR
SH from Labour, SR = bal. fig. 20,000 hours × ₹ **20** = ₹ 4,00,000 (i.e. Col.3 ₹ 4,10,000 **–** Cost Var. ₹ 10,000 A)	AH from Labour, SR from Col.1 19,500 hours × ₹ 20 = ₹ 3,90,000	(given) ₹ 4,10,000

Efficiency Variance =₹ 4,00,000–₹ 3,90,000 =₹ 10,000 F + **Expenditure** Variance =₹ 3,90,000–₹ 4,10,000 =₹ 20,000 A

Total VOH Cost Variance (given) = ₹ 10,000 A

4. Answer – (i) Std Price of RM = ₹ 5 per kg, (ii) Std Qtty p.u. of Output = 10 Kg, (iii) Std Rate of Labour = ₹ 15 ph, (iv) Std Time for Actual Production = 2 hrs pu and 20,000 hours for 10,000 units, (v) Std VOH Rate = ₹ 20 ph.

Question 4(b): Network Analysis – Rescheduling / Updating 8 Marks



After 15 days of working the following progress is noted for the Network of an Erection Job:

(i) Activity 1–2, 1–3, and 1–4 completed as per original schedule.
(ii) Activity 2–4 is in progress and will be completed in 3 more days.
(iii) Activity 3–6 is in progress and will need 18 days more for completion.
(iv) Activity 6–7 appears to present some problem and its new estimated time of completion is 12 days.
(v) Activity 6–8 can be completed in 5 days instead of originally planned for 7 days.

You are required to:

(i) Update the above diagram after 15 days of the start of work based on the assumption given above.
(ii) Write down the Critical Path with Total Project Duration.

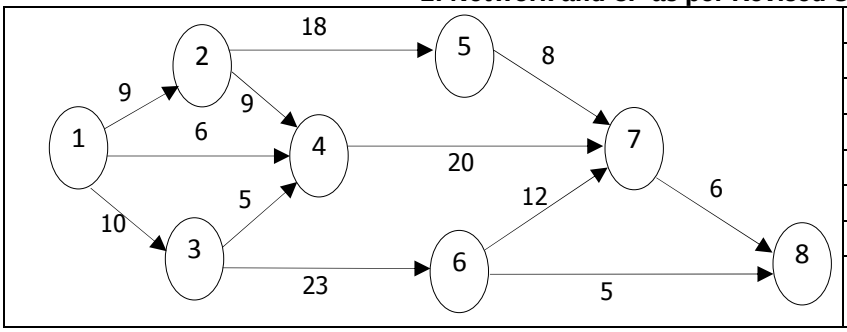
Solution: **Similar to Page 19.16, Q.No.7 [M 07]**

1. Revised Duration of Activities after 15 days for Updation

Activity	Preceding Activity	Date of Completion	Revised Duration
2–4	1–2	15 + 3 = 18 days	18 – 9 (for Activity 1 – 2) = 9 days
3–6	1–3	15 + 18 = 33 days	33 – 10 (for Activity 1 – 3) = 23 days
6–7	1–3 & 3–6		Given = 12 days
6–8	1–3 & 3–6		Given = 5 days

Note: Assumed no Change in duration of other activities, viz. 3–4, 2–5, etc.

2. Network and CP as per Revised Schedule



Paths	Duration (In Days)
1–2–5–7–8	9+18+8+6 = 41
1–2–4–7–8	9+9+20+6 = 44
1–4–7–8	6+20+6 = 32
1–3–4–7–8	10+5+20+6 = 41
1–3–6–7–8	**10+23+12+6 = 51(max)**
1–3–6–8	10+23+5 = 38
Revised Critical Path, i.e. Longest Path = 1–3–6–7–8 = **51 days.**	

Question 5(a): Learning Curve + Life Cycle Costing + Pricing 8 Marks

MP Ltd has developed a special product. Details are as follows:

- The product will have a life cycle of 5,000 units. It is estimated that the market can absorb first 4,500 units at ₹ 64 per unit, and then the product will enter the "decline" stage of its life cycle.
- The Company estimated the following cost structure:

Direct Labour	₹ 6 per hour
Other Variable Costs	₹ 19 per unit

- Fixed Costs will be ₹ 40,000 over the life cycle of the product. The Labour Rate and both of these costs will not change throughout the product's life cycle.
- The first batch of 100 units will take 1,000 Labour Hours to produce. There will be an 80% Learning Curve that will continue until 2,500 units have been produced. Batches after this level will each take the same amount of time as the 25th Batch. The Batch Size will always be 100 units.

Calculate:

(i) Cumulative Average Time per Batch for the first 25 Batches.
(ii) Time taken for the 25th Batch if Average Time for 24 Batches is 359.40 hours.
(iii) Average Selling Price of the final 500 units, that will allow the Company to earn a Total Profit of ₹ 80,000 from the product.
(Note: Learning Coefficient is –0.322 for Learning Rate of 80%)
The values of Logs have been given for calculation purpose: log2 = 0.30103, log3 = 0.47712, log5 = 069897
antilog of 2.534678 = 342.51 antilog of 2.549863 = 354.70 antilog of 2.555572 = 359.40 antilog of 2.567698 = 369.57

Solution: **Similar to Page 20.8, Illustration 9 [M 08]**

1. $y = ax^b$ a= Labour Time of 1st Batch = 1,000 Hours
   b = Learning Coefficient for 80% = given = –0.322
   x = 25 [**Note:** $25 = 5^2$. In Log Form, log 25 = 2 × log 5]

   log y = log a + b log x
   = log 1,000 + (– 0.322) × log 25
   = log 1,000 + (– 0.322) × 2 log 5
   = 3.0000 + (– 0.322) × 2 × (0.69897)
   = 3 + (–0.45014) = 2.54986

   Hence y = Antilog of 2.54986 = given = 354.70. So, Average Time Per Batch for 25 Batches = **354.70 hours**

2. Time taken for 25th Batch = (354.70 × 25 Batches) – (359.40 × 24 Batches) = 8,867.5–8,625.6=**241.9 hours**

3. Labour Cost of 50 Batches = Cost of 1 to 24 Batches + Cost of 25 to 50 Batches
   = (359.4 hrs × 24 batches × ₹ 6) + (241.9 hrs × 26 batches × ₹ 6)
   = ₹ 51,753.60 + ₹ 37,736.40 = ₹ 89,490

4. Required Sale Value of 50 Batches = 5,000 Units = (Material + Labour + FOH + Required Profit)
   = (₹ 19 × 5,000 Units + ₹ 89,490 + ₹ 40,000 + ₹ 80,000) = **₹ 3,04,490**

5. Of the above, Sale Value of 1st 4,500 Units at ₹ 64 Per Unit = ₹ 2,88,000

6. So, Sale Price of the 'Decline' stage 500 Units = $\frac{₹\ 3,04,490 - ₹\ 2,88,000}{500\ \text{Units}}$ = **₹ 32.98 pu.**

Question 5(b): Relevant Cost – Depot vs Dealership – Evaluation 8 Marks

XY Ltd is manufacturing a consumer product and doing marketing through 200 Depots all over the country. The Company is considering closing down the Depots and resorting to Dealership arrangements. The Total Turnover of the Company is ₹ 160 Crores per annum. The following information is given for each depot. ₹ in Lakhs

Annual Turnover	80.00
Average Inventory	16.00
Administrative Expenses per annum	1.60
Staff Salary per annum	2.88

The Inventory Carrying Cost is 16% p.a. which is also the interest rate prevailing in the market for Working Capital Finance. The Other Fixed Cost per annum is ₹ 16 Crores. Marketing through Dealers would involve engaging Dealers for each area. The Dealers will assure minimum sales of each area. This would result in increasing the capacity utilization from 80% to 100%. At present, the Company's PV Ratio is 20%. Marketing through dealers would involve payment of Commission of 8% on sales. Half of the existing Depot Staff will have to be absorbed in the Company. The Dealer will deposit ₹ 3.20 Crores with the Company on which interest at 12% p.a. will be paid.

You are required to work out the impact on profitability of the company by accepting the proposal.

Solution: **Notes**

1. Present Sales of ₹ 160 Crores = 80%. So, Sales at 100% Capacity = ₹ 200 Crores. Hence, Additional Sales = ₹ 40 Crores. (i.e. ₹ 4,000 Lakhs).
2. Assumed that other Fixed Cost ₹ 16 Crores will be incurred irrespective of the decision i.e. Depot or Dealer.
3. Cost – Benefit Analysis is as under –

Relevant Costs	₹ Lakhs	Relevant Benefits	₹ Lakhs
Commission = 8% of 4,000	320	Additional Contribution = 4,000 × 20% **(WN 1)**	800.00
Int paid on Dealer Deposits = 320 Lakhs × 12%	38.4	Savings in Staff Salary [50% of 2.88]	1.44
		Savings on Depot Administration Expense	1.60
		Savings on Inventory Carrying Cost [16 × 200 Depots = 3,200 Lakhs × 16%]	512.00
Additional Net Benefit	**1,007.84**	Interest on Additional Funds available by way of Dealer Deposits [320 Lakhs × 16%]	51.20
	1,366.24		**1,366.24**

Question 6(a): Marginal Costing / Decision making – effect of Automation 8 Marks

A manufacturing unit of ABC Co. Ltd has presented the following details:

Average Units produced and sold per month	2,40,000
No. of Workers	80
sales Value	₹ 60 Lakhs
Contribution	₹ 24 Lakhs
Wage Rate	₹ 5 per unit

The Production Manager proposes to introduce a new automated machine due to which following changes will take place:

1. No. of units produced and sold are expected to increase by 20%.
2. No. of workers will be reduced to 60.
3. With a view to provide incentive for increased production, Production Manager intends to offer 1% increase in Wage Rate for every 3% increase in average individual output achieved.
4. Decrease in Selling Price by 2%.

Required: Calculate amount of extra contribution after introduction of new automated machine, and give your recommendations.

Solution: **Similar to Page 2.85, Q.No.7.3 [M 99]**

Particulars	**Before Automation**		**After Automation**	
1. Total Output	(Given) = 2,40,000 units		2,40,000 + 20% = 2,88,000 units	
2. No. of Employees	80		60	
3. Output per Employee (1÷2)	3,000 units		4,800	
	Per Unit	**Total**	**Per Unit**	**Total**
4. Selling Price / Sales	₹ 60,00,000 ÷ 2,40,000 = ₹ 25.00	(Given) ₹ 60,00,000	₹ 25.00 – 2% = ₹ 24.50	2,88,000×24.50= ₹ 70,56,000
5. Variable Costs:				
(a) Labour	(given) ₹ 5.00		₹ 5+20%=₹ 6.00	
(b) Others (bal. fig)	(bal. fig) ₹ 10.00		(same) ₹ 10.00	
6. Contribution (4 – 5)	₹ 24,00,000 ÷ 2,40,000 = ₹ 10.00	(Given) ₹ 24,00,000	₹ 8.50	2,88,000×8.50= ₹ 24,48,000

Note: Average Individual Output increase = $\frac{₹\ 4,800\ (-)\ ₹\ 3,000}{3,000\ \text{Units}}$ = 60%.

Since Average Individual Output has increased by 60%, Bonus entitlement will be 20%.

Decision: Increase in Monthly Contribution = ₹ 24,48,000 – ₹ 24,00,000 = **₹ 48,000**. Hence the Project is **acceptable.**

Question 6(b): LPP – Graphical Method 8 Marks

A Manufacturer produces two types of products, i.e. X and Y. Each of these products requires three types of processing. The processing time for each unit and the profit per unit are given in the following table:

	Product X (hours/unit)	Product Y (hours/unit)	Available Capacity per day (hours)
Process I	12	12	840
Process II	3	6	300
Process III	8	4	480
Profit per unit (₹)	5	7	

Using Graphical Method, how many units of each product should the Company manufacture per day in order to maximize profit?

Solution: **Similar to Page 18.39, Q.No.31 [N 08]**

Let the number of units of the 2 Products be x & y respectively. The LPP is framed as under –

Objective Function: Maximize Profit Z = 5x + 7y

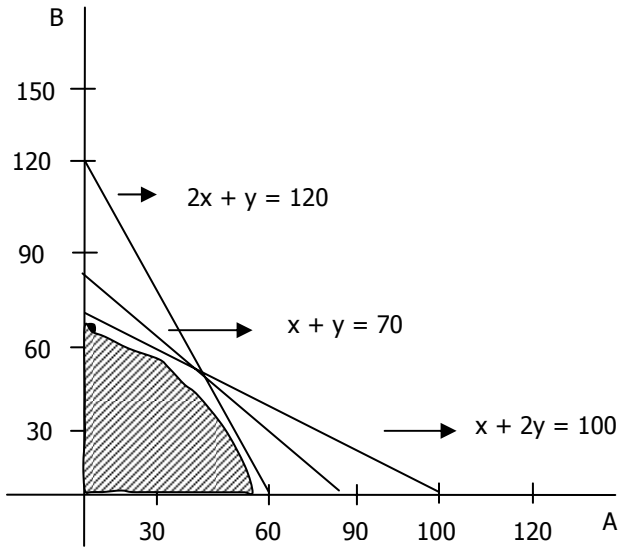
Subject to Constraints: $12x + 12y \le 840$ i.e $x + y \le 70$

$3x + 6y \le 300$ i.e $x + 2y \le 100$

$8x + 4y \le 480$ i.e $2x + y \le 120$

Non–Negativity Assumption: $x, y \ge 0$

Constraint	When x = 0	When y = 0	Co–ordinates
x + y = 70	y = 70	x = 70	(0,70); (70,0)
x + 2y = 100	y = 50	x = 100	(0,50); (100,0)
2x + y = 120	y = 120	x = 60	(0,120); (60,0)



The above co–ordinates are depicted and the Feasible Region is identified on the Graph as under:

Solving (1) & (2), x + y = 70 and x + 2y = 100;
we have **x= 40, y = 30**

Solving (1) & (3), 2x + y = 120 and x + y = 70;
we have **x= 50, y = 20**

Value of Z at different corners of feasible region

Point	Value of Z = 5x + 7y
(0, 50)	350
(40, 30)	**410 (maximum)**
(50, 20)	390
(60, 0)	300

Answer: x = 40 units and y = 30 units

Question 7(a): Assignment – Interpretation of Steps 8 Marks

Answer the following independent situation relating to an assignment problem with a minimization objective:

(i) Just after row and column minimization operations, we find that a particular row has two zeros. Does this implies that the 2 corresponding numbers in original matrix before any operation were equal? Why?

(ii) Under the usual notation, where A_{32} means the element at the intersection of the 3rd Row and 2nd Column, we have, in a 4×4 Assignment Problem, A_{24} and A_{32} figuring in the optimal solution. What can you conclude about the remaining assignment? Why?

Solution: **Same Question in Page 16.12, Illustration 13 [N 13]**

Case (i)

- It is **not necessary** that the two corresponding numbers in the original matrix, before any operation should be equal.
- Any one of the two zeroes in that Row may have been derived out of Column minimum operations also.
- **Example:**

1. Original Matrix			2. Row Operations			3. Column Operations		
7	6	4	3	2	0	3	1	0
8	9	11	0	1	3	0	0	3
4	6	8	0	2	4	0	1	4

Note: R_{21} & R_{22} are zero after Row and Column Minimum Operations, but the numbers in the original matrix are '8' and '9' respectively.

Case (ii)

The given information is	Inference:
a a a a a a a [0] a [0] a a a a a a Where 'a' represents numbers ≥ 0, and all 'a' are not equal.	• The remaining assignments shall be – (i) a_{11} and a_{43} (or) (ii) a_{13} and a_{41}. • In these elements, the value of 'a' will be zero. • This is due to the one–for–one assignment Rule, i.e. (i) two jobs cannot be assigned to the same person, (ii) two persons cannot be assigned the same job.

Question 7(b): Performance Measurement – BSC 4 Marks

Classify the following under appropriate categories in Balanced Score Card

Solution: **Refer Page 14.13, Q.No.11 [M 09, M 12]**

Question	**Perspective**
(i) Research & Development	Innovation & Learning Perspective
(ii) New Product introduction	Internal Business Perspective
(iii) Price	Customer Perspective
(iv) Cost Leadership	Innovation & Learning Perspective
(v) Sales Penetration	Internal Business Perspective
(vi) Profitability	Financial Perspective
(vii) Sales	Financial Perspective
(viii) Quality	Customer Perspective

Question 7(c): Simulation – Theory 4 Marks

How would you use the Monte Carlo Simulation Method in Inventory Control?

Solution: **Refer Page 21.2, Q.No.7 [M 97, N 01, N 03, M 08, N 10]**

Question 7(d): 4 Marks

Indicate 2 Activity Drivers in respect of each of the following Activity Cost Pools:

Question	Answer
(i) Manufacturing Cost	(a) No. of Units of Products (b) Time taken for Products (c) No. of Processes/Stages in Production
(ii) Human Resources Cost	(a) No. of Employees (b) Rate of Labour Turnover (c) No. of Training Programmes
(iii) Marketing & Sales Costs	(a) No. of Advertisements/ Insertions (b) No. of Sales Personnel (c) Sales Revenue
(iv) Accounting Costs	(a) No. of Transactions (b) No. of Divisions/ Branches (c) No. of Reports to be generated under MIS or applicable Reporting Framework

Note: Refer Page 8.2 for other Cost Drivers

Question 7(e): Pricing – Theory 4 Marks

What is Penetration Pricing? What are the circumstances in which this policy can be adopted?

Solution: **Refer Page 3.9, Q.No.25 [RTP, N 93, M 95, M 99, M 01, M 03, N 06, N 08, M 09, M 10]**