SUGGESTED ANSWER OF ADVANCED MANAGEMENT ACCOUNTING 2016(MAY)

1. (a) UK Ltd. prepared a draft budget for the next year as follows: **5**

Quantity	**10,000 units**
	(₹.)
Selling price per unit	60
Variable cost per unit	
- Direct materials	16
- Direct labour (2 hours x Rs. 6)	12
- Variable overheads (2 hrs* Rs. 1)	2
contribution per unit	30
Total budgeted contribution	3,00,000
Total budgeted fixed contribution	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, in spite 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:

Calculation of target labour time required to achieve target profit

Particulars		**Amount (₹)**
Target Sales (12,000 units × ₹ **64**)		7,68,000
Less: Target/Budgeted Profit		50,000
Total Target Cost		7,18,000
Less: Fixed Cost		
- Existing	₹ 2,80,000	
- Advertisement	₹ 57,000	3,37,000
Total Target Variable Cost		3,81,000

÷ ***No. of units***		12,000
Target Variable cost per unit		31.75
Less: Direct Material per unit		16.00
Target Labour and variable overheads cost per unit		15.75
÷ ***Labour and variable overhead cost per hour***		
- Labour cost per hour	₹ 8	
- Variable Overhead per hour	₹ 1	9.00
Target Labour hours per unit (A)		1.75
Existing Lour hours per unit (B)		2
Reduction in Labour hour required (A - B)		0.25

(b) Supreme Prakashan Ltd. is in the business of publishing a leading newspaper which has a wide customer base. It measure quality of service in term of

(i) Print quality
(ii) On time delivery
(iii) Number of damaged and unsold paper

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, 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:

Determination of Incremental profit from installation of new system

Particulars		**₹**
Increase in contribution $\{\frac{₹36,000}{1\%} \times (97\% - 85\%)\} \times 40\%$		1,72,800
Saving in variable coat of newspaper damaged (6000 - 1000) × 40		2,00,000
Total		3,72,800
Less: Additional Operational Cost of new system		
- Additional	₹ 3,00,000	
- Opportunity Cost (4,00,000 × ₹ 9%)	₹ 36,000	3,36,000
Incremental Profit		36,800

(c)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 end of the fifth year

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

Solution

Determination of relevant cost of proposal of different options and its rank

	(i) Own car (₹)	(ii) Executive car (₹)	(iii) Agency car (₹)
Fixed Cost			
Depreciation on Car (₹ 1,00,000 – ₹ 20,000)/5	16,000	-	-
Insurance Cost	1,200	1,200	-
Taxes	800	-	800
Total (A)	18,000	1,200	800
Fixed cost per km (A ÷ $\mathbf{20,000}$ $\boldsymbol{kms}$)	0.90	0.06	0.04
Running and Maintenance Cost			
- Petrol	0.60	-	0.60
- Repair and Maintenance	0.20	-	-
- Tyre	0.12	-	0.12
Reimbursement	-	1.60	1.00
Total cost per km. (B)	1.82	1.66	1.76
Cost for 20,000 (B × $\mathbf{20,000}$)	36,400	33,200	35,200
Ranking of alternative proposals	III	I	II

Decision: Second alternative i.e. use of own car, is the best alternative from company's point of view.

(d) The cost per unit of transporting goods from the factories X, Y, and Z to destination A, B, C, and D and the quantities demanded and supplied are given: 5

Factories	**Destinations**				**Supply**
	A	B	C	D	
X	25	50	20	25	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:

Since, question is silent about method to be used in determination of initial solution we use Vogel's Approximation Method (VAM):

Initial solution by using VAM:

Factories	**Destination**				**Supply**
X	× 25	× 50	100 20	× 25	100/-
Y	150 30	× 40	50 35	50 10	250/200
Z	100 20	100 10	× 25	× 35	200/100
Demand	250/150/0	100/0	150/50/0	50/0	

Penalty			
5	5	5	-
20	← 20	5	5
10	5	5	5

Penalty

5	30↑	5	25
5	-	5	15
5	-	5↑	0
10↑	-	10	-

Since, numbers of allocated cells are equal to m+n-1/ R+C-1 (i.e. Number of Rows + Number of Column - 1) hence above solution is ready for the optimality test.

Determination of value of ui and vj by using $c_{ij} = u_i + v_j$, where u_3 is assumed 0 as specified in the question.

Factories	**Destination**				**u_i**
X	25	50	100 20	25	$u_1 = -5$
Y	150 30	40	50 35	50 10	$u_2 = 10$
Z	100 20	100 10	25	35	$u_3 = 0$ (assume)
v_j	$v_1 = 20$	$v_2 = 10$	$v_{3=25}$	$v_{4=0}$	

Determination of opportunity cost or cell evaluation of each unallocated/empty cell (i, j) by using $\Delta_{ij} = c_{ij} - (u_i + v_j)$:

Factories	**Destination**				**u_i**
X	(10) 25	(45) 50	[100] 20	(30) 25	$u_1 = -5$
Y	[150] 30	(20) 40	[50] 35	[50] 15	$u_2 = 10$
Z	[100] 20	[100] 10	(0) 25	(35) 35	$u_3 = 0$ (assume)
v_j	$v_1 = 20$	$v_2 = 10$	$v_{3=25}$	$v_{4=0}$	

Since, value of Δ_{ij} are non negative (either zero or more than zero) hence above solution is optimum. If Δ_{ij} is zero then it represents alternative solution. Number of alternative solution is totally depended upon number of Δ_{ij} came as zero. In the above solution one alternative solution can be obtained by reallocating units by using loop.

2. (a) A company produces and sells a single product. The cost date per units for the years 2017 is predicted as below: 8

	₹ Per unit
Direct material	35
Direct labour	25
variable overheads	15
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 of the product.
The stock level of material remains unchanged throughout the period.
The following additional information regarding cost 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:

a. To introduce training programmes for the workers 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.

b. 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 cost 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

(i) Determination of rejected items, faulty items and scrap items before and after acceptance of proposal

Particulars	Before acceptance (units)	After acceptance (units)
Demand	28,000	28,000
Add: Rejected items by customers	4,000 ($28000 \times \frac{12.5}{87.5}$)	2,940 ($28000 \times \frac{9.5}{90.5}$)
Units delivered to customers	32,000	30,940
Faulty units	8,000 ($32,000 \times \frac{20}{80}$)	3,438 ($30,940 \times \frac{10}{90}$)
Gross Production	40,000	34,378
Add: Scrapped due to damage in storage	4,444.44 ($40,000 \times \frac{10}{90}$)	3,820 ($34,378 \times \frac{10}{90}$)

Statement of expected quality cost for the 2017 of Company before and after acceptance of proposal

Particulars	Before acceptance (₹)	After Acceptance (₹)
Preventive Cost		
- Training programme cost	-	4,50,000
Appraisal Cost		
- Annual Quality control consultant charges	-	50,000
Internal Failure Cost		
- Scrap item	1,55,556	1,33,700

- Faulty units	(4,444.44 × 35) 6,00,000 (8,000 × 35)	(3,820 × 35) 2,57,850 (3,438 × 75)
External Failure cost - Rejected item cost • Manufacturing cost • Delivery cost	 3,00,000 (4,000 × 75) 20,000 (4,000 × 5)	 2,20,500 (2,940 × 75) 14,700 (2,940 × 5)
Total cost of quality	10,75,556	11,26,750

(ii) On the pure financial reason based TQM and proposal should not be accepted because it increases cost by 51,194.
But based on non-financial reasons it should be accepted because it reduce external failure (rejected items) by 3% and faulty units production by 10% which will image of company in the eyes of customer.

Note: Scrap items valued at material acquisition cost, Faulty units are valued at manufacturing cost whereas rejected items are valued at total variable cost (Manufacturing cost + Delivery cost).

(b) 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:

	Department A per ₹ 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 Lacs and in department B is ₹ 18 Lacs.

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:

Computation of total cost of Product Y

Particulars		₹
Direct Material		
- Deptt. A (8 kg × ₹ **4**)	32	
- Deptt. B (4 kg × ₹**6**)	24	56.00
Direct Labour		
- Deptt. A (2 hour × ₹ **14**)	28	
- Deptt. B (3 hour × ₹ **12**)	36	64.00
Variable overheads		
- Deptt. A (₹ 32 × ₹ **0.80**)	25.60	
- Deptt. B (3 hour × ₹ **2.00**)	6.00	31.60
Total Variable cost per unit		141.60
Fixed overheads		
- Deptt. A (₹ 32 × ₹ **2.20**)	70.40	
- Deptt. B (3 hour × ₹ **3.00**)	9.00	79.40
Total Cost		261

Determination of total investment

Particulars	**Amount (₹)**
Portion of Plant and Machinery	
- Deptt. A (₹ 22,00,000 × **40**%)	8,80,000
- Deptt. B (₹ 18,00,000 × **40**%)	7,20,000
Working capital	2,72,800
Total	18,72,800

(i) Calculation of selling price of product Y

Particulars	**(₹)**
Variable cost per unit	141.60
Add: Contribution per unit (18,72,800 × **25**% × **1/12**)/2000	19.51
Selling price per unit	161.11

(ii) If product Y is new product and about to be launched in the market then company should implement penetration strategy i.e. selling price should be variable cost per unit

(iii) If Product Y is a well established product in the market then minimum selling price should be total cost per unit i.e. ₹ 261.

3. (a) Division X and Y are two division of XY Ltd., which operates 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:

Budgeted Income Statement of Division X

Particulars	₹ in '000
Sales Revenue	6,000
Component purchase 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 company 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 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 the Division Y will not incur variable selling marketing cost on units transferred to the 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:

(i)

Division X

Statement of profit if selling price reduced by ₹ 20 and units are not procured from Division Y

Particulars	(₹)
Sales Revenue (39,600 × ₹ **180**)	71,28,000
Less: Variable cost	
- Component cost (39,600 × ₹ **35**)	13,86,000
- Other variable costs (39,600 × ₹ **56**)	22,17,600
- Marketing cost (39,600 × ₹ **9**)	3,56,400
Contribution	31,68,000
Less: Fixed Cost	
- Manufacturing cost	4,80,000
- Marking cost	8,55,000
Revised Operating profit (A)	18,33,000
Existing operating profit (B)	16,65,000
Incremental operating profit (A - B)	1,68,000

Division X should reduce its selling price by ₹ 20 even if it is not able to procure the component from Division Y at ₹ 25 per unit.

(ii)

Division Y

Statement of revised profit if 39,600 units transferred to Division X at ₹ 25

Particulars	(₹)
Sales Revenue	
- Division X (39,600 × ₹ **25**)	9,90,000
- Market (45,400 × ₹ **50**)	22,70,000
Total Revenue	32,60,000
Less: Variable cost	
- Material and labour cost (85,000 × ₹ **15**)	12,75,000
- Marketing cost (45,400 × ₹ **3**)	1,36,200
Contribution	18,48,800
Less: Fixed Cost	7,20,000
Revised Operating profit (A)	11,28,800
Existing operating profit (B)	12,00,000
Incremental operating profit (A - B)	(71,200)

Division Y should not transfer units to Division X at ₹ 25.

(b) 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 components 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 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 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:

(i)

Statement of Production Budget for Product M & N

Particulars	**M**	**N**
Inventory at the end of year	10,000	20,000
Add: Sales	80,000	1,50,000
Total Requirements	90,000	1,70,000
Less: Inventory at the beginning of the year	30,000	50,000
Required Production	60,000	1,20,000

Budgeted Requirements of Components P, Q and R

Particulars	**P**	**Q**	**R**
For product M:			
- P (60,000 × **1**)	60,000	-	-
- Q (60,000 × **2**)	-	1,20,000	-
For Product N:			
- P (1,20,000 × **2**)	2,40,000	-	-
- Q (1,20,000 × **1**)	-	1,20,000	-
- R (1,20,000 × **2**)	-	-	2,40,000
For Component R:			
- Q (3,60,000 × **1**)	-	2,40,000	-
Total	3,00,000	4,80,000	2,40,000

(ii) Optimum Order Quantity/ Economic Order Quantity = $\sqrt{\frac{2AO}{C}}$

Where,

A = Annual Consumption (in case of M = 3,00,000 and N = 4,80,000)

O = Ordering Cost per order (i.e. ₹ 1,500 per order)

C = Carrying Cost per unit per annum (Purchasing cost per unit × $Carryiing\ cost$ %)

Component M = $\sqrt{\frac{2 \times 3,00,000 \times 1,500}{20 \times 20\%}}$ = 15,000

Component N = $\sqrt{\frac{2 \times 4,80,000 \times 1,500}{8 \times 20\%}}$ = 30,000

4 (a) 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 and cost (actual)

Production	10,000 units
Direct Materials (1,05,000 kg.)	₹ 5,20,000
Direct Labour (19,500 hrs.)	₹ 3,08,000
Variable Overheads	₹ 4,10,000

Cost variances

Direct materials – Price	₹ 5,000 (F)
Direct materials – Usages	₹ 25,000 (A)
Direct labour – Rate	₹ 15,500 (A)
Direct labour – Efficiency	₹ 7,500 (F)
Variable overheads	₹ 10,000 (A)

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.
You are required to 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:

i) Material Price Variance = (Actual Quantity × Standard Price) – (Actual Quantity × Actual price)
500(F) = (1,05,000 × Standard Price) – (5,20,000)
Standard Price = $\frac{₹\ 5,25,000}{1,05,000\ Kg}$
Standard Price = ₹ 4 per kg

ii) Material Usages Variance = (Standard Quantity × Standard Price) – (Actual Quantity × Standard price)
25,000(A) = (Standard Quantity × ₹ 5) - (1,05,000 × ₹ 5)
Standard Quantity × ₹ 5 = ₹ 5,25,000 -₹ 25,000
Standard Quantity = $\frac{₹\ 5,00,000}{₹\ 5}$
Standard Quantity = 1,00,000 kg

iii) Labour Rate Variance = (Actual Hours × Standard Hours) – (Actual Hours × Actual Rate)
15,500(A) = (19,500 × Standard Rate) - ₹ 3,08,000
Standard Rate = $\frac{₹\ 2,92,500}{19,500}$
Standard Rate = ₹ 15

iv) Labour Efficiency Variance = (Standard Hours × Standard Rate) – (Actual Hours × Standard Hours)
7500(F) = (Standard Hours × ₹ 15) – (19,500 × ₹ 15)
Standard Hours = $\frac{₹\ 3,00,000}{₹\ 15}$
Standard Hours = 20,000 hours

v) Variable overhead Variance = Standard Overheads – Actual Overheads
10,000(A) = Standard Overheads - ₹ 4,10,000
Standard Overheads = ₹ 4,00,000
Standard Variable Overheads = Standard Hours × Standard Rate
₹ 4,00,000 = 20,000 × Standard Rate
Standard Rate = $\frac{₹\ 4,00,000}{20,000}$ = ₹ 20

(b) 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 competed as per original schedule.
(ii) Activity 2-4 is in progress and will be complete 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:

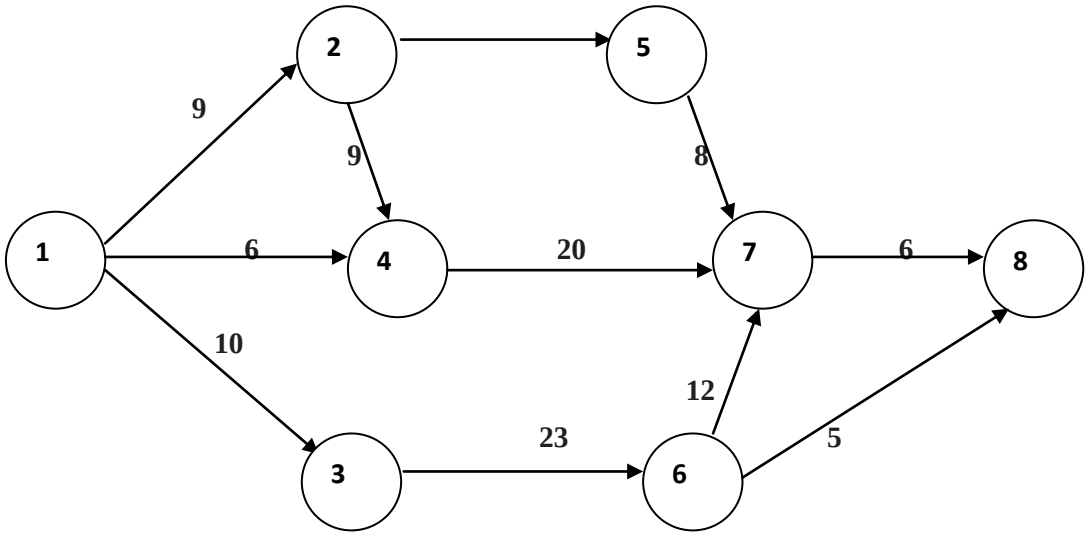
(i) Update the above diagram after 15 days of the start of work based on the assumption given above.
(ii) Write down the critical path with total project duration.

Solution:

i) Statement of Revised Duration of Activities

Activity	Calculation	Revised Duration
1-2	-	9
1-3	-	10
1.4	-	6
2-4	(15 + 3 – 9)	9
2-5	-	18

3-4	-	5
3-6	(15 + 18 - 10)	23
4-7	-	20
5-7	-	8
6-7	-	12
6-8	-	5
7-8	-	6



ii) Possible Paths and its duration:

Possible Paths	Calculation	Duration (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
1-3-6-8	10+23+5	38

Critical Path is 1-3-6-7-8 and its duration is 51 days.

5. (a) 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 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 estimates 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 cost will not change throughout the product's life cycle.

The first batch 0f 100 units will take 1,000 labour hours to produce. There will be 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 25^{th} batch. The batch size will always be 100 units.

Calculate: -

(i) The cumulative average time per batch for the first 25 batches.
(ii) The time taken for the 25^{th} batch if average time for 24 batches is 359.40 hours.
(iii) The 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 = 0.69897

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:

(i) Determination of average time required per batch for the first 25 batches.
Average accumulated hours (y) = ax^b
When,
a = Time required for first batch
x = cumulated batch
b = learning co- efficient

3.000- 0.1573
2.8426

$Y = ax^b$
log y = log 1000 + (-0.322) × log 25
log y = 3.0000 + (-0.322) × 2 × log 5
= 3.0000 + (-0.322 × 2 × 0.69897)
= 3.0000 – 0.44501
= 2.5498
Antilog of 2.5498 = 354.70

(ii) Time required for 25th batch
= (Total accumulated hour upto25th batch) – (cumulated hour upto 24th batch)
= (354.70 × 25) – (359.40 × 24)
= 8867.50 – 8625.60
= 241.90

(iii) Computation of aver5age selling price of final 500 units to earn total profit of 80,000

Particulars	**(₹)**
Labour cost	
- First 2500 units (8867.50 × ₹6)	53205
- Last 2500 units (241.90 × 25 × ₹ 6)	36285
Add: other variable cost (5000 × ₹ 19)	95000
	1,84,490
Add: Fixed cost	40.000
Total	2,24,490
Add: Desired Profit	80,000
	3,04,490
(-) Sales Revenue of first 45,000 units (4,500 × ₹ 64)	2,88,000
Sale Revenue from 500 units	16,490
÷ No of units	500
	32.98

5. (b) 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 for each area. This would result in increasing the capacity utilization from 80% to 100%. At present the company's P/V 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 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:

Statement of incremental profitability on acceptance of proposal

Particulars	**(₹ lakh)**
Incremental Revenue	
Incremental contribution (4000 × 20%)	800
Saving of staff salary (2.88 × 50% × 200)	288
Administration expense (1.60 × 200)	320
Interest Saving on Investor deposits (16 × 200 × 16%)	512
Deposit from dealers (3.20 × 200 × 16%)	102.40
	2022.40
Less:	
- Commission (20,000 × 8%)	1600
- Interest payments (3.20 × 200 × 12%)	76.80
Incremental Profit	345.60

Working Note:

(1) Total turnover at 80% = 160 crores

Additional turnover $\left(160\ crores \times \frac{20}{80}\right)$ = 40

Total = 200 crores

(2) It is assumed other fixed cost will not affected with decision.

(3) Administration expenses are treated as specific cost.

(4) Since administration expanses, staff salary & deposit are taken as per depot basis.

6. **(a)** 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 Lacs
Contribution	₹ 24 Lacs
Wage rate	₹ 5 per unit

The production manager purposes 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 reduce 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:

Statement of additional contribution

	Before	**After**	**Increment**
No. of units (A)	2,40,000 (₹)	2,88,000 (₹)	48,000 (₹)
Sales Required	25.00	24.50	-
(-) Variable cost p.u.			
- Wages	5	6	
- Others	10	10	
Contribution (B) per unit	10	8.50	
Total Contribution(A × B)	24,00,000	24,48,000	48,000

Extra contribution after introduction of new automated machine is ₹ 48,000.

Working Note

Increase in average individual output:-

Total Budgeted production (2,40,000 × 120%)	2,88,000 units
÷ No. of worker	60
Revised Production	4800
(-) Existing Production	3000
Increase in Production	1800

% increase in Production $= \frac{1800 \times 100}{3000} = 60\%$

Revised Rate $= ₹\ 5 + ₹\ 5 \times \frac{60\% \times 1}{3\%}$

$= ₹\ 5 + ₹\ 1$

$= ₹\ 6$

6. (b) 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 processing each unit and the profit per unit are given in the following table:

	Product X (hr/unit)	**Product Y (hr/unit)**	**Available capacity per day (hr.)**
Process I	12	12	840
Process II	3	6	300
Process III	8	4	480
profit per unit (₹)	5	7	

Applying Graphical method, how many units of each product should the company produce per day in order to maximize profit?

Solution:

Let

x = No. of units Production of Product x

y = Number of units Produced of Product y

Objective

Maximisation of Profit

Maximize (z) = 5x + 7y

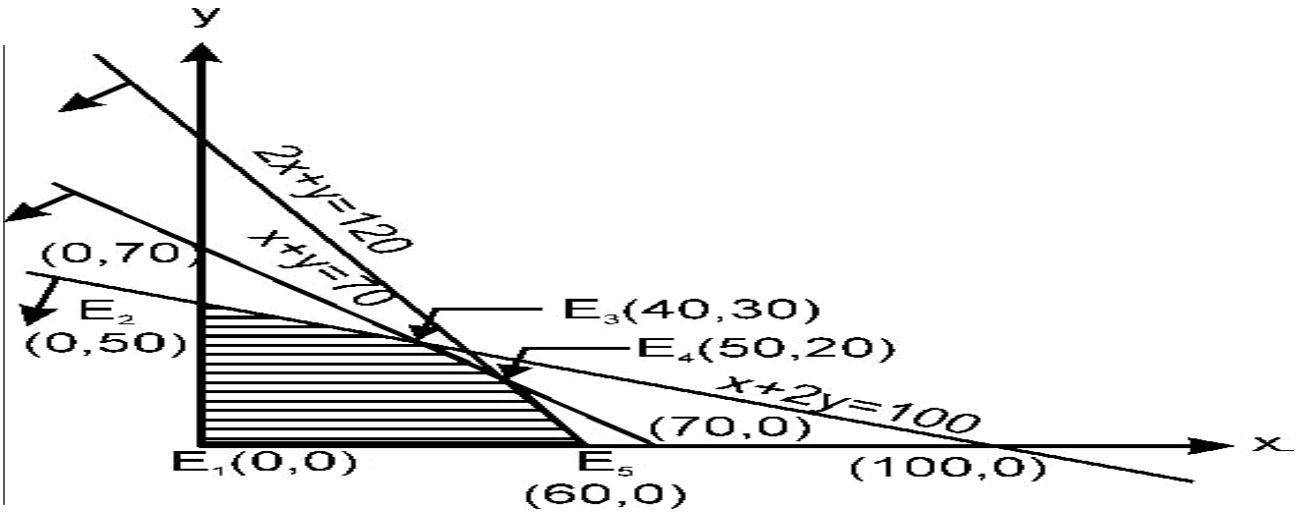
Subject to Constraints

$12x + 12y \leq 840$

$3x + 6y \leq 300$

$8x + 4y \leq 480$

$x \geq 0;\ ,\ y \geq 0$



Equation – (i)

$12x + 12y = 840$

$= 12 (x + y) = 840$

$x + y = 70$

x	0	70
y	70	0

Equation – (ii)

$3x + 6y = 300$

$3 (x + 2y) = 300$

$X + 2y = 100$

x	0	100
y	50	0

Equation (iii)

$8x + 4y = 480$

$4(2x + y) = 480$

$2x + y = 120$

x	20	60
y	80	0

The shaded portion in the diagram represents the feasible region.

The shaded portion in the diagram (on previous page) represents the feasible region, and the matrix of the extreme points

E_i,i = 1, 2, 3, 4, 5 is

Statement of possible profit at all points

Point	**Number of units**		**Contribution Per Unit**		**Total Contribution**
	x (a)	y (b)	x (c)	y (d)	**(a × c) + (b × d)**
E1	0	0	5	7	0
E2	0	50	5	7	350
E3	40	30	5	7	410
E4	50	20	5	7	390
E5	60	0	5	7	300

Since 410 is the largest element in EC, the maximum value is achieved at the extreme point E_3 whose coordinates are (40, 30).

Thus to maximize profit, the company should produce 40 units of X and 30 units of Y.

7. Answer any **four** out of the following **five** questions:

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

i) Just after row and column minimum operations, we find that a particular row has 2 zeroes. Does this imply that the 2 corresponding numbers in the 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 assignments? Why?

Answer:

i) Prerequisite of assignment of any job is each row and column must have a zero value in its corresponding cells. To obtained zero in every row and column row operation and column operation are carried on. It is not essential two corresponding numbers in original matrix, before any operation should be equal to make two zeros in the same row. Two may derived because of only row operation or row and column operation also.

ii) In the given assignment matrix two allocations have been made in a_{24} (2nd row and 4th column) and a_{32} (3rd row and 2nd column). This implies that 2nd and 3rd row and 4th and 2nd column are unavailable for further allocation.
Therefore, the other allocations are at either at a_{11} and a_{43} or at a_{13} and a_{41}.

b) Classify the following under appropriate categories in Balanced Score Card:

Ans:

(i)	Research and Development	Innovation and Learning Prospective
(ii)	New product introduction	Internal Business Prospective
(iii)	Price	Customer Prospective
(iv)	Cost Leadership	Innovation and Learning Prospective
(v)	Sales penetration	Internal Business Prospective
(vi)	Profitability	Financial Prospective
(vii)	Sales	Financial Prospective
(viii)	**Quality**	Customer Prospective

c) How would you use the Monte Carlo simulation method in inventory control?

Ans: In order to provide efficient service to the customers it is necessary to choose to re-order point with proper consideration of demand during lead time.
If the lead time and demand of inventory per unit time both are random variables then, the simulation technique can be applied to determine the effect & alternate inventory policy on a stochastic inventory system.

The basic approach under this system is to find the probability distribution of the input and output functions of the past data.

d) Indicate 2 activity drivers respect of each of the following activity cost pools:
Solution:

i) Manufacturing cost	• Number of hours worked • Number of units produced
ii) Human resource cost	• Number of employees • Number of employees working hours
iii) Marketing resources cost	• Number of advertisement • Number of sales personnel • Sales revenue
iv) Accounting costs	• Number of branches • Number of transaction • Seles revenue

e) What is penetration pricing? What are the circumstances in which this policy can be adopted?

Answer:
Meaning of penetration pricing

- Penetration pricing is a policy of low prices when the product is first launched in order to obtain sufficient penetration into the market.
- It is opposite to skimming pricing.

Circumstances in which a penetration policy may be appropriate:

(i) The demand is highly elastic and so would respond well to low price.
(ii) If the firm wishes to discourage new entrants into the market.
(iii) If the firm wishes to shorten the initial period of the product's life cycle in order to enter growth and maturity stages as quickly as possible.
(iv) When there is substantial savings on large-scale production, here increase in demand is sustained by the adoption of low pricing policy.