2. MATERIAL COST

ASSIGNMENT SOLUTIONS

PROBLEM NO: 1

a) Economic order quantity = $\sqrt{\frac{2AO}{IC}}$

A = Annual consumption

O = Ordering cost per order

C = Carrying cost per unit per annum=8*2/100=0.16

EOQ = $\sqrt{\frac{2AS}{C}} = \sqrt{\frac{2 \times 10{,}000 \times 50}{0.16}}$ = 2500 units

No. of orders to be placed in a year= Total consumption of materials per annum /EOQ

=10000/2500= 4Orders per year.

PROBLEM NO: 2

i) EOQ = $\sqrt{\frac{2AS}{C}}$

Where,

A = Annual usage of raw material

= 1,500 units x 12 months = 18,000 units

S = Ordering cost per order = Rs.75

C = Carrying cost per unit per annum

= Purchase price x % of carrying cost

= 1000 x 3% [2%+1%]

= Rs.30

EOQ = $\sqrt{\frac{2AS}{C}} = \sqrt{\frac{2 \times 18{,}000 \text{ units} \times 75}{Rs.30}}$ = 300 units.

ii) Re-order level = Maximum usage x Maximum lead time

= 400 units x 8 weeks

= 3,200 units

Statement showing total cost of raw material

Particulars	With discount (Order size = 6,000 units)	Without discount (EOQ = 300 units)
Purchase price per unit	Rs.950 (Rs.1,000-5%)	1,000
Carrying cost per unit per annum	28.5 (950 x 3%)	30 (1,000 x 3%)
(a) Total carrying cost p.a [Order size/EOQ x ½ x C]	85,500 [6,000 x ½ x 28.5]	4,500 [300 x ½ x 30]
(b) Total ordering cost p.a	225	4,500

$\left[\frac{A}{\text{Order size/EOQ}} \times S\right]$	$\left[\frac{18,000}{6,000} \times 75\right]$	$\left[\frac{18,000}{300} \times 75\right]$
(c) Purchase of raw material (Qty x Price)	1,71,00,000 [18,000 x 950]	1,80,00,000 [18,000 x 1,000]
Total cost of raw material (a+b+c)	**1,71,85,725**	**1,80,09,000**

Total cost is less at discount offer.

Therefore, it is advised to accept the discount offer.

PROBLEM NO: 3

Calculation of Economic Order Quantity:

i) EOQ = $\sqrt{\frac{2AS}{C}} = \sqrt{\frac{2 \times 60,000 \text{ packs} * 12 \text{ months x } 240}{228 * 10\%}}$ = 3893.3 packs or 3893 packs

ii) Number of orders per year

$\frac{Annual requirement}{EOQ} = \frac{7,20,000 \text{ packs}}{3893 \text{ packs}}$ =184.9 or 185 orders a year

iii) Ordering and storage cost

PARTICULARS	Amt.
Ordering costs :– 185 orders *240	44,400.00
Storage cost :– ½ (3,893 packs *10% of 228)	44,380.20
Total cost of ordering & storage	88,780.20

iv)Timing of next order

a) Day's requirement served by each order

Number of days requirement = $\frac{Annual requirement}{EOQ}$ = No.of working days/No.of order in a year=360 days/185 orders=1.94 days supply.

This implies that each order of 3893 packs supplies for requirement of 1.94 days only.

b) Days requirement covered by inventory

= units in inventory /economic order quantity *(days requirement served by an order)

=10033/3893packs*1.94 days =5 days requirement.

c) Time interval for placing next order

=Inventory left for day's requirement – Average lead time of delivery

=5 days – 5 days = 0 days

This means that next order for the replenishment of supplies has to be placed immediately.

PROBLEM NO: 4

Order size (Q) (Units)	*No. of orders A÷Q (Units)	Cost of purchase A × cost per unit	Ordering cost A/Q *12,500	Carrying cost Q/2*C*25%	Total cost (3+4+5)
1	2	3	4	5	6
40	12.5	48,00,000	1,56,250	48,000	50,04,250

		(500*9600)		(40*9600*0.25/2)	
50	10	46,80,000 (500*9,360)	1,25,000	58,500 (50*9360*0.25/2)	48,63,500
100	5	45,60,000 (500 × 9,120)	62,500	1,14,000 (100*9120*0.25/2)	47,36,500
200	2.5	44,40,000 (500 × 8,880)	31,250	2,22,000 (200*8880*0.25/2)	46,93,250
300	1.67	43,20,000 (500 ×8,640)	20,875	3,24,000 (300*8640*0.25/2)	46,64,875

A = Annual requirement

The above table shows that the total cost of 500 units including ordering and carrying cost is minimum (` 46,64,875) where the order size is 300 units. Hence the most economical purchase level is 300 units.

(*Note: Practically number of orders should be rounded off to the nearest whole number)

ii) Calculation of Economic Order Quantity (EOQ), when no discount is available

$$EOQ = \sqrt{\frac{2AS}{C}} = \sqrt{\frac{2 \times 500 \text{ tonnes} * 12{,}500}{10{,}500 * 25\%}} = 69 \text{ tonnes}$$

PROBLEM NO: 5

a)Re order quantity = Economic order quantity = $\sqrt{\frac{2AO}{IC}}$

Where A = Annual consumption = 7,500 units x 12 months = 90,000 units

O = Ordering cost per order = Rs.500

IC = Inventory carrying cost p.a. = Rs.60 x 10% = Rs.6

$\therefore$ Re-order quantity = $\sqrt{\frac{2(90{,}000) \times Rs.500}{Rs.6}}$ = 3,873 units (Approx.)

b) Re-order level = Maximum consumption x Maximum re-order period

= 75 units x 8 weeks

= 6,000 units

c) Minimum stock level = Re-order level – (Avg consumption x Avg Re-order period)

= 6,000 units – (500 units x $\frac{5+8}{2}$ weeks)

= 6,000 units – 3,250 units = 2,750 units

d) Maximum stock level = (Reorder level + reorder quantity) – (Minimum consumption x minimum Reorder period)

= 6,000 units + 3,873 units – (250 units x 5 weeks)

= 9,873 units – (1,250 units) = 8,623 units

e) Average stock level = $\frac{\text{Minimum stock level} + \text{Maximum stock level}}{2}$

= $\frac{2{,}750 \text{ units} + 8{,}623 \text{ units}}{2}$

= 5,687 units.

PROBLEM NO: 6

i) EOQ = $\sqrt{\frac{2AS}{C}} = \sqrt{\frac{2 \times 12{,}000 * 12}{0.24}}$ = 1095 units or 1100 units

ii) Re-order level= safety stock + normal lead time consumption

= (12,000*30/360) + (12000*15/360)

=1000+500

=1500 units.

iii) safety stock = consumption per day * no.of days

= 12,000*30/360= 1000 units.

PROBLEM NO: 7

Working Notes:

i) Computation of Annual consumption & Annual Demand for raw material 'Dee':

Particulars	Amt.
Sales forecast of the product 'Exe'	10,000 units
Less: Opening stock of 'Exe'	900 units
Fresh units of 'Exe' to be produced	9,100 units
Raw material required to produce 9,100 units of 'Exe' (9,100 units × 2 kg.)	18,200 kg.
Less: Opening Stock of 'Dee'	1,000 kg
Annual demand for raw material 'Dee'	17,200 kg

(ii) Computation of Economic Order Quantity (EOQ):

EOQ = $\sqrt{\frac{2AS}{C}} = \sqrt{\frac{2 \times 17{,}200\ kg * 720}{125 * 13.76\%}}$ = 1200 kg.

(iii) Re- Order level:

= (Maximum consumption per day × Maximum lead time)

$= \left\{\left(\frac{annual consumption\ of\ dee}{364\ days} + 20kg\right) * 8 days\right\}$

$= \left\{\left(\frac{18{,}200\ kg}{364\ days} + 20kg\right) * 8 days\right\}$ =560 kg.

(iv) Minimum consumption per day of raw material 'Dee':

Average Consumption per day = 50 Kg.

Hence, Maximum Consumption per day = 50 kg. + 20 kg. = 70 kg.

So Minimum consumption per day will be

Average Consumption= $\frac{\min imum\ consumption + \max imum\ consumption}{2}$

50 kg = $\frac{\min imum\ consumption + 70\ kg}{2}$

Min. consumption = 100 kg – 70 kg. = 30 kg.

(a) Re-order Quantity :

EOQ – 200 kg. = 1,200 kg. – 200 kg. = 1,000 kg.

(b) Maximum Stock level:

= Re-order level + Re-order Quantity – (Min. consumption per day × Min. lead time)

= 560 kg. + 1,000 kg. – (30 kg. × 4 days)

= 1,560 kg. – 120 kg. = 1,440 kg

(c) Minimum Stock level:

= Re-order level – (Average consumption per day × Average lead time)

= 560 kg. – (50 kg. × 6 days) = 260 kg.

(d) Impact on the profitability of the company by not ordering the EOQ.

		When purchasing the ROQ	When purchasing the EOQ
I	Order quantity	1,000 kg.	1,200 kg.
II	No. of orders a year	17,200kg./1000 kg =17.2or18orders	17,200kg./1200 kg =14.33or14orders
III	Ordering Cost	18 orders × 720 = `12,9	15 orders × 720 = 10,800
IV	Average Inventory	1000 kg/2=500 kg	1200kg/2=600 kg
V	Carrying Cost	500 kg. × 17.2 = 8,60	600 kg. × 17.2 = 10,320
VI	Total Cost	21,560	21,120

Extra Cost incurred due to not ordering EOQ = 21,560 - 21,120 = 440

PROBLEM NO: 8

Inventory turnover ratio $= \frac{\text{Cost of goods sold}}{\text{Average Stock}}$

Inventory turnover ratio of A $= \frac{10,000 + 52,000 - 6,000}{\left(\frac{10,000 + 6,000}{2}\right)} = \frac{\text{Rs.}56,000}{\text{Rs.}8,000} = 7$ times

Inventory turnover ratio of B $= \frac{9,000 + 27,000 - 11,000}{\left(\frac{11,000 + 9,000}{2}\right)} = \frac{\text{Rs.}25,000}{\text{Rs.}10,000} = 2.5$ times

Note: COGS = Opening stock +purchases - closing stock

Average stock = $\frac{\text{Opening stock} + \text{Closing stock}}{2}$

Comment: Material A is faster moving than Material B

PROBLEM NO: 9

Statement showing computation of effective quantity of each chemical available for use

Particulars	Chemical A (Kg)	Chemical B (Kg)	Chemical C (Kg)
Quantity purchased	3,000	5,000	2,000
Less: Shortage due to breakage	(200)	(280)	(100)
	2,800	**4,720**	**1,900**
Less: Provision for further deterioration 5%	(140)	(236)	(95)
	2,660	**4,484**	**1,805**

Statement showing total cost of material

Particulars	Chemical A (Rs.)	Chemical B (Rs.)	Chemical C (Rs.)
Purchase price	12,600	19,000	9,500
Add: Sales Tax*	630	950	475
Railway Freight*	300	500	200
Octroi duty @ 0.1 kg	300	500	200
cartage paid	22	63.12	31.8
	13,852	**21,013.12**	**10,406.8**

Rate per Kg.

Chemical A = $\frac{\text{Rs.13,852}}{\text{2660 kgs}}$ = Rs.5.2

Chemical B = $\frac{\text{Rs.21,013.20}}{\text{4484 kgs}}$ = Rs. 4.6

Chemical C = $\frac{\text{Rs.10,406.80}}{\text{1805 kgs}}$ = Rs. 5.7

* Sales tax is apportioned on the basis of purchase price

* Railway freight is apportioned in the ratio of quantity purchased.

PROBLEM NO: 10

Item	Units	% of Total units	Unit cost (`)	Total cost	% of total cost	Ranking
1	7,000	3.1963	5	35,000	9.8378	4
2	24,000	10.9589	3	72,000	20.2378	2
3	1,500	0.6849	10	15,000	4.2162	7
4	600	0.2740	22	13,200	3.7103	8
5	38,000	17.3516	1.5	57,000	16.0216	3
6	40,000	18.2648	0.5	20,000	5.6216	6
7	60,000	27.3973	0.2	12,000	3.3730	9
8	3,000	1.3699	3.5	10,500	2.9513	11
9	300	0.1370	8.00	2,400	0.6746	12
10	29,000	13.2420	0.40	11,600	3.2605	10
11	11,500	5.2512	7.10	81,650	22.9502	1
12	4,100	1.8721	6.20	25,420	7.1451	5

Basis for selective control (Assumed)

50,000 & above -- 'A' items

15,000 to 50000 -- 'B' items

Below ` 15,000 -- 'C' items

On this basis, a plan of A B C selective control is given below:

Ranking	Item Nos.	% of Total units	cost	% of Total cost	category
1	11	5.2512	81,650	22.9502	
2	2	10.9589	72,000	20.2378	
3	5	17.3516	57,000	16.0216	
Total	3	33.5617	2,10,650	59.2096	A
4	1	3.1963	35,000	9.8378	
5	12	1.8721	25,420	7.1451	
6	6	18.2648	20,000	5.6216	
7	3	0.6849	15,000	4.2162	
Total	4	24.0181	95,420	26.8207	B
8	4	0.2740	13,200	3.7103	
9	7	27.3973	12,000	3.3730	
10	10	13.2420	11,600	3.2605	
11	8	1.3699	10,500	2.9513	
12	9	0.1370	2,400	0.6746	
Total	5	42.4202	49,700	13.9697	C
Grand Total	12	100	3,55,770	100	

Advantages of ABC analysis: The advantages of ABC analysis are the following:

(i) Continuity in production: It ensures that, without there being any danger of interruption of production for want of materials or stores, minimum investment will be made in inventories of stocks of materials or stocks to be carried.

(ii) Lower cost: The cost of placing orders, receiving goods and maintaining stocks is minimised specially if the system is coupled with the determination of proper economic order quantities.

(iii) Less attention required: Management time is saved since attention need be paid only to some of the items rather than all the items as would be the case if the ABC system was not in operation.

(iv) Systematic working: With the introduction of the ABC system, much of the work connected with purchases can be systematized on a routine basis to be handled by subordinate staff.

THE END