10. JOINT AND BY PRODUCTS

PROBLEM NO: 1

Statement Showing Apportionment of Joint Cost

Products	Output in Kgs	Joint Cost
L	2500	$10,000\left(20,000\times\frac{2,500}{5,000}\right)$
M	1000	$4,000\left(20,000\times\frac{1,000}{5,000}\right)$
N	1500	$6,000\left(20,000\times\frac{1,500}{5,000}\right)$
	5000	20,000

Statement showing profit/Loss of each product

Particulars	L	M	N	Total
Output (Kgs)	2500	1000	1500	
S.P. per Kg	Rs.5	Rs.10	Rs.20	
Sales. (in Rupees)	12,500	10,000	30,000	52,500
(-) Post separation cost	10,000	5,000	15,000	30,000
	2,500	5,000	15,000	22,500
(-) Joint cost	10,000	4,000	6,000	20,000
Profit/(Loss)	(7500)	1000	9000	2500

PROBLEM NO: 2

i) **Allocation of Joint Cost by the following methods:**

a) **Sales Value at split - off Method**

Products	Sales value of the point of split off (Rs.)	Joint cost allocated (Rs.)
M	20,00,000	$10,00,000\left(\frac{Rs.20,00,000}{Rs.80,00,000}\right)$ xRs.40,00,000
N	12,00,000	$6,00,000\left(\frac{Rs.12,00,000}{Rs.80,00,000}\right)$ xRs.40,00,000
O	20,00,000	$10,00,000\left(\frac{Rs.20,00,000}{Rs.80,00,000}\right)$ xRs.40,00,000
P	28,00,000	$14,00,000\left(\frac{Rs.28,00,000}{Rs.80,00,000}\right)$ xRs.40,00,000
Total	**80,00,000**	**40,00,000**

b) **Physical output (gallon) Method**

Products	Physical output (in gallon)	Joint cost allocated (Rs.)
M	3,00,000	$24,00,000\left(\frac{3,00,000gallons}{5,00,000gallons}\right)$ xRs.40,00,000
N	1,00,000	$8,00,000\left(\frac{1,00,000gallons}{5,00,000gallons}\right)$ xRs.40,00,000
O	50,000	$4,00,000\left(\frac{50,000gallons}{5,00,000gallons}\right)$ xRs.40,00,000

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P	50,000	$4,00,000\left(\frac{50,000gallons}{5,00,000gallons}\right)$ xRs.40,00,000
Total	**5,00,000**	**40,00,000**

c) Estimated Net Realizable Value Method

Products	Sales revenue after further processing (Rs.)	Sales revenue at the point of split off (Rs.)	Further processing costs (Rs.)	Net realizable value (Rs.)	Joint cost allocated (Rs.)
(a)	(b)	(c)	(d)	(e) = [(b) – (d)] or (c)	
'Super M'	1,20,00,000	--	80,00,000	40,00,000	$20,00,000\left(\frac{Rs.40,00,000}{Rs.80,00,000}\right)$ xRs.40,00,000
'Super N'	40,00,000	--	32,00,000	8,00,000	$4,00,000\left(\frac{Rs.8,00,000}{Rs.80,00,000}\right)$ xRs.40,00,000
'O'	--	20,00,000	--	20,00,000	$10,00,000\left(\frac{Rs.20,00,000}{Rs.80,00,000}\right)$ xRs.40,00,000
'Super P'	48,00,000	--	36,00,000	12,00,000	$6,00,000\left(\frac{Rs.12,00,000}{Rs.80,00,000}\right)$ xRs.40,00,000
Total			**1,48,00,000**	**80,00,000**	**40,00,000**

ii) Decision about the further refining of Product M, N or P.

Products	M (Rs.)	N (Rs.)	P (Rs.)
Sales revenue after further processing: (A)	1,20,00,000	40,00,000	48,00,000
Sales revenue at the point of split off: (B)	20,00,000	12,00,000	28,00,000
Incremental sales revenue: (C)={(A)-(B)}	1,00,00,000	28,00,000	20,00,000
Further processing cost: (D)	80,00,000	32,00,000	36,00,000
Profit (Loss) arising due to further processing: {(C) – (D)}	20,00,000	(4,00,000)	(16,00,000)

It is apparent from above that further processing of products N and P results in the decrease of the operating profit by Rs. 20,00,000. Hence M/s. Sunshine Oil Company should not resort to further processing of its N and P products. This decision on adoption would increase the operating profits of the company for the month of March, 2014 by Rs. 20,00,000.

PROBLEM NO: 3

Input in Department: A = 8,00,000 kgs.

Yield = 85%

Therefore, output = 6,80,000 kgs (8,00,000 x 85%)

Ratio of output for P and Q = 70:30

Product P = 6,80,000 x 70% = 4,76,000 kgs.

Product Q = 6,80,000 x 30% = 2,04,000 kgs.

Statement Showing Apportionment of Joint Cost

Particulars	P	Q	Total
Product in kgs	4,76,000	2,04,000	
Selling price per kg	Rs.85	Rs.290	

Sales (Rs.in Lakhs)	404.60	591.60	996.20
(-) Selling expenses	24.60	21.60	46.20
Net Sales	380.00	570.00	950.00
Ratio of net sales (Note)	40%	60%	100%
Joint cost (W.N)	316	474	790

Note: Joint cost is apportioned on the basis of ratio of net sales.

Working Note:

Joint Cost = Raw Material + Process Cost in Department 'A'

= 8,00,000 kgs x 80 + 1,50,00,000

= Rs.790 Lakhs.

Statement Showing the Profitability of further Processing of Product P and Converted into product AR

Product AR: Output 90% of 4,76,000 kgs = 4,28,400 kgs.

Particulars	Rs.in Lakhs
Joint Cost	316
Cost of Department: B	64
Selling Expenses	16.80
	396.80
Sales Value (4,28,400 x 115)	492.66
Profit (492.66-396.80)	95.86

If 'p' is not processed profitability is as under.

Particulars	Rs.in Lakhs
Sales Value (476000 x 85)	404.60
(-) Selling expenses	24.60
Net sales	380.00
(-) Joint Cost	316.00
Profit	64.00

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Further process of product 'p' and Converting into Product 'AR' is beneficial to the Company because the profit increases by Rs.31.86 Lakhs (95.86 - 64.00).

PROBLEM NO: 4

i) Comparison of alternative Joint-Cost Allocation Methods:

a) Sale value at split-off point Method

Particulars	Chocolate Powder Liquor base	Milk Chocolate Liquor base	Total
Sale Value of products at split off	Rs.2,99,250 $\left(\frac{3000\text{lbs}}{200\text{lbs}}\right) \times 20\text{gallon} \times 997.50$	Rs.5,55,750 $\left(\frac{5100\text{lbs}}{340\text{lbs}}\right) \times 30\text{gallon} \times 1{,}235$	Rs.8,55,000
Weight	0.35	0.65	1.00
Joint cost	Rs.2,49,375 $(2712{,}500 \times 0.35)$	Rs.4,63,125 $(712{,}500 \times 0.65)$	Rs.7,12,500

b) Physical Measure Method

Particulars	Chocolate powder Liquor base	Milk Powder Liquor base	Total
Output (W.N - 1)	300 gallon	450 gallon	750 gallon
Weights	$\frac{300}{750} = 0.40$	$\frac{450}{750} = 0.60$	1.00

Joint Cost Allocation	Rs.2,85,000 (7,12,500 × 0.40)	Rs.4,27,500 (7,12,500 × 0.60)	Rs.7,12,500

WORKING NOTE 1:

$\left(\frac{3000lbs}{200lbs}\right) \times 20gallon = 300$ gallon

$\left(\frac{5100lbs}{340lbs}\right) \times 30gallon = 450$ gallon

c) Net Realizable Method

Particulars	Chocolate powder Liquor base	Milk Chocolate Liquor base	Total
Final Sales value of production	Rs.5,70,000 (3,000 lbsx190)	Rs.12,11,250 (5100lbsx237.50)	Rs.17,81,250
(-) Separate Costs	Rs.3,02,812.50	Rs.6,23,437.50	Rs.9,26,250
Net realizable value at split off point	Rs.2,67,187.50	Rs.5,87,812.50	Rs.8,55,000
Weight	0.3125 (2,67,187.50 / 8,55,000)	0.6875 (5,87,812.5 / 8,55,000)	1.00
Joint cost	Rs.2,22,656.25 (7,12,500 x 0.3125)	Rs.4,89,843.75 (7,12,500 x 0.6875)	Rs.7,12,500

(d) Constant Gross Margin / % Method NRV

Particulars	Chocolate powder Liquor base (Rs.)	Milk Chocolate Liquor base (Rs.)	Total (Rs.)
Final Sales value	570,000	12,11,250	17,81,250
(-) Gross Margin 8%	45,600	96,900	1,42,500
Cost of goods available for sale	5,24,000	11,14,350	16,38,750
(-) Separable Costs	3,02,812.50	6,23,437.50	9,26,250
Joint Cost allocated	2,21,587.50	490,912.50	7,12,500

WORKING NOTES:

Sales = Rs.17,81,250

(-) Joint & separable cost = Rs.16,38,750 (Rs.712500 + Rs.926250)

Gross Margin = Rs. 1,42,500

Gross Margin% $= \left(\frac{142,500}{17,81,250}\right) \times 100 = 8\%$

Chocolate Powder Liquor base

Particulars	Sale value at Split off (Rs.)	Physical Measure (Rs.)	Estimate net Realizable value (Rs.)	Constant Gross Margin NRV (Rs.)
Final sale value	5,70,000	5,70,000	5,70,000	5,70,000
(-) Separable cost	(3,02,812.50)	(3,02,812.50)	(3,02,812.50)	(3,02,812.50)
(-) Joint Cost	(2,49,375)	(2,85,000)	(2,22,656.25)	(2,21,587.50)
Gross Margin	17,812.50	(17,812.50)	44,531.25	45,600
Gross Margin%	3.125%	(3.125%)	7.8125%	8.00%

Milk Chocolate Liquor base (Amount in Rupees)

Particulars	Sale value at split off	Physical Measure	Estimated NRV	Constant Gross Margin NRV
Sale value	12,11,250	12,11,250	12,11,250	12,11,250
(-) Separable cost	(6,23,437.50)	(6,23,437.50)	(6,23,437.50)	(6,23,437.50)
(-) Joint cost	(4,63,125)	(4,27,500)	(489,843.75)	(490,912)
Gross Margin	1,24,687.50	1,60,312.50	97,968.75	96,900.50
Gross Margin%	10.29%	13.24%	8.09%	8.00%

Further processing of Chocolate powder Liquor base into chocolate powder

Particulars	Amount (Rs.)
Incremental Revenue (Rs.5,70,000 - (Rs.997.50 x 300 gallons)	2,70,750
(-) Incremental Cost	3,02,812.50
Incremental operating Income	(32,062.50)

Further processing of Milk Chocolate Liquor base into Milk Chocolate

Particulars	Amount (Rs.)
Incremental Revenue [12,11,250-(1,235 x 450gallons)]	6,55,500
(-) Incremental cost	6,23,437.50
Incremental operating Income	32,062.50

The above Computation show that 'P' Ltd Chocolates could increase operating income by Rs. 32,062.50. If chocolate Liquor base is sold at split off point and milk chocolate liquor base is processed further.

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PROBLEM NO: 5

i) Statement showing apportionment of joint cost (on the basis of sale value at split off point)

Products	A	B	X	Total
Production (in quantity (kgs.))	18,000	1,000	54,000	-
Selling price P.U at split off point (in Rs.)	50	40	10	-
Sale value at split off point (in Rs.)	9,00,000	4,00,000	5,40,000	18,40,000
Apportionment of Joint cost	6,30,000	2,80,000	3,78,000	12,88,000

ii) Statement showing the cost per kg of each product

Products	A	B	X
Joint cost apportioned	6,30,000	2,80,000	378,000
Production in kgs	18,000	10,000	54,000Rs.
Joint cost per kg	Rs.35	Rs.28	Rs.7
Further processing cost	$10\left(\frac{180000}{18000}\right)$	$15\left(\frac{1,50,000}{10,000kgs}\right)$	$2\left(\frac{1,08,000}{54,000kgs}\right)$
Total Cost per kg	45	43	9

iii) Statement showing the Product wise and total profit for the period

Products	A	B	X	Total
Sale value	12,24,000	2,50,000	7,92,000	
(+) Closing stock value (W.N.2)	45,000	2,15,000	90,000	
Value of Production	12,69,000	4,65,000	8,82,000	26,16,000
Apportionment of joint cost	6,30,000	2,80,000	3,78,000	
(+) Further processing cost	1,80,000	1,50,000	108,000	
Total Cost	8,10,000	430,000	486,000	17,26,000
Profit	459,000	35,000	396,000	890,000

WORKING NOTES:

1) Calculation of selling price per kg.

Products	A	B	X
(a) Sale value	12,24,000	2,50,000	7,92,000
(b) Quantity sold	17,000 kgs	5000 kgs	44,000 kgs
Selling price per kg (a/b)	Rs.72	Rs.50	Rs.18

2) Valuation of Closing stock.

Since the selling price per kg of products A, B, and X is more than their total costs. Closing stock will be valued at cost.

Products	A	B	X	Total
Closing stock (kgs)	1000	5000	10,000	
Cost per kg	45	43	9	
Closing stock value	45000	2,15,000	90,000	3,50,000

iv) Statement for processing decision **(Amount in Rs.)**

Products	A	B	X
a) Selling price per kg at split off point (in Rupees)	50	40	10
b) Selling price per kg after further processing	72	50	18
c) Incremental selling price per kg (in Rupees) (b - a)	22	10	8
Less: further processing cost per kg	(10)	(15)	(2)
Incremental profit (loss) per kg in Rupees	12	(5)	6

Product A and X has an incremental profit per unit after further processing, hence, these two products may be further processed. However, further processing of product B is not profitable. Hence product 'B' shall be sold at split off point.

PROBLEM NO: 6

i) Statement of profitability of an Oil Mill (after carrying out further processing) for the quarter ending 31st March 2016.

Products	Sales Value after further processing	Share of Joint cost	Additional processing cost	Total cost after Processing	Profit (loss)
ACH	1,72,500	98,667	43,000	1,41,667	30,833
BCH	15,000	19,733	9,000	28,733	(13,733)
CSH	6,000	4,933	--	4,933	1,067
DSH	45,000	24,667	1,500	26,167	18,833
	2,38,500	1,48,000	53,500	2,01,500	37,000

ii) Statement of profitability at the split off point

Products	Selling price of split off	Output (in units)	Sales value at split off point	share of joint cost	profit at split off point
ACH	15.00	8,000	1,20,000	98,667	21,333
BCH	6.00	4,000	24,000	19,733	4,267
CSH	3.00	2,000	6,000	4,933	1,067
DSH	7.50	4,000	30,000	24,667	5,333
			1,80,000	1,48,000	32,000

Note: Share of Joint Cost has been arrived at by considering the sales value at split off point.

PROBLEM NO: 7

i) Statement of showing allocation of Joint cost

Particulars	R1	L1
Number of units produced	2,000	3,000
Selling price per unit (in Rupees)	60	70
Sale value (in Rupees)	1,20,000	2,10,000
(-) Estimated profit on sales (R_1-25%, L_1-30%)	(30,000)	(63,000)
Cost of sales	90,000	1,47,000
(-) Estimated Selling Expenses (R_1-10%, L_1-15%)	(12,000)	(31,500)
Cost of production	78,000	1,15,500
(-) Cost after separation	(38,000)	(26,000)
Joint Cost allocated	40,000	89,500

ii) Statement of Profitability **(in Rupees)**

Particulars	G_1	R_1	L_1
Sale Value	6,00,000 (4000 x150)	1,20,000 (2,000 x 60)	210,000 (3,000 x 70)
(-) Joint Cost	(2,98,500) (4,28,000 - 40,000 - 89,500)	(40,000)	(89,500)
(-) Cost after separation	-	(38,000)	(26,000)
(-) Selling Expenses	(1,20,000)	(12,000)	(31,500)
Profit	1,81,500	30,000	63,000

Total Profit = 1,81,500 + 30,000 + 63,000

= Rs. 2,74,500

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PROBLEM NO: 8

Working Notes:

i) Computation of Allocation Ratio for Joint Costs

Particulars	Products		
	X (Rs.)	Y (Rs.)	Z (Rs.)
Selling Price	13.75	8.75	7.50
Less anticipated margin@ 25% on cost of 20% on sales	2.75	1.75	1.50
Cost of sales	11.00	7.00	6.00
Less: post split-off cost	5.00	4.00	2.50
Joint cost per unit	6.00	3.00	3.50
Output (units)	8,000	6,000	4,000
Total output cost	48,000	18,000	14,000
Allocation ratio for joint costs	24	9	7

ii) Computation of net allocable joint costs

Particulars	Rs.	Rs.
Joint input cost including material cost		90,800
Less: Credit for realization from by-product B: Sales revenue (1,000 × Re. 1)	1,000	
Less: profit @ 25% on cost or 20% on sales	200	800
Net joint costs to be allocated		90,000

Determination of joint cost per unit of each product

Product	Net joint costs allocation (Rs.)	Output (units) (Rs.)	Joint cost per unit (Rs.)
X	54,000 (Note: 1)	8,000	6.75
Y	20,250	6,000	3.38
Z	15,750	4,000	3.94
	90,000		

Profit margin available on each product as a percentage on cost

Product	Joint Cost (Rs.)	Post spilt-off cost (Rs.)	Total Cost (Rs.)	Selling Price (Rs.)	Margin (Rs.)	Margin % on cost (Rs.)
X	6.75	5.00	11.75	13.75	2.00	17.02
Y	3.38	4.00	7.38	8.75	1.37	18.56
Z	3.94	2.50	6.44	7.50	1.06	16.46

Note: 1

$X = \frac{24}{40} \times 90,000 = Rs.\ 54,000$

$Y = \frac{9}{40} \times 90,000 = Rs.\ 20,250$

$Z = \frac{7}{40} \times 90,000 = Rs.\ 15,750$

Rs. 90,000

PROBLEM NO: 9

i) Statement showing allocation of Joint Cost

Particulars	P	Q
No. of units Produced	2,500	1,500
Selling Price Per unit (Rs.)	80	50
Sales Value (Rs.)	2,00,000	75,000
Less: Estimated Profit (P-30% & Q -25%)	(60,000)	(18,750)
Cost of Sales	1,40,000	56,250
Less: Selling Expenses (Refer Working note-1)	(25,000)	(15,000)
Cost of Production	1,15,000	41,250
Less: Cost after separation	(60,000)	(30,000)
Joint Cost allocated	55,000	11,250

ii) Statement of Profitability

Particulars	M (Rs.)	P (Rs.)	Q (Rs.)
Sales Value (A)	7,65,000	2,00,000	75,000
(4,500 × Rs.170)			
Less: Joint Cost	1,83,750	55,000	11,250
(2,50,000-55,000- 11,250)			
– Cost after separation	-	60,000	30,000
– Selling Expenses (Refer Working note-1)	45,000	25,000	15,000
(B)	2,28,750	1,40,000	56,250
Profit (A - B)	5,36,250	60,000	18,750
Overall Profit = Rs. 5,36,250 + Rs. 60,000 + Rs. 18,750 = Rs. 6,15,000			

iii) If the by-product P is not further processed and is sold at the point of separation:

Particulars	Amount (Rs.)
Sales value at the point of separation (2,500 units × Rs. 60)	1,50,000
Less: Joint cost	55,000
Profit	95,000
Profit after further processing	60,000
Incremental Profit	35,000

If the by-product P is sold at the point of separation, it will give an additional profit of Rs. 35,000 to the company, hence, the company should sell by-product P without further processing.

Working Note:

1. Apportionment of Selling expenses among M, P and Q

Product M - $\frac{Rs.85,000}{17} \times 9$ = Rs. 45,000

By-product P - $\frac{Rs.85,000}{17} \times 5$ = Rs. 25,000

By-product Q - $\frac{Rs.85,000}{17} \times 3$ = Rs. 15,000

THE END

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