3. LABOUR

PROBLEM NO: 1

Statement showing the Earnings of an employee 'X' of ABC & co

Particulars	Amount (Rs.)
a) Basic salary(Rs.1,000/- x 12 months)	12,000/-
b) Dearness Allowance(Rs.200x12 months)	2,400/-
c) Bonus @ 20% of salary & DA [(Rs.12,000+2,400)x20%]	2,880/-
d) Other Allowance (Rs.250x12 months)	3,000/-
Employer's Contribution to PF [(12,000+2,400) x10%]	1,440/-
e) Total Earnings	21,720/-

No of hours effectively worked by the employee   = Total hours – Non productive hours

$$= 2,400 – 400$$

$$= 2,000 \text{ hours}$$

∴ Effective hourly cost of employee **'X'**   = Total Earnings/2000 hrs

$$= Rs.21,720/2000hr$$

$$= Rs10.86 \text{ per hour}$$

PROBLEM NO: 2

Calculation of Earnings of A & B for a month

Particulars	A (Rs.)	B (Rs.)
Basic wages	100	160
Dearness Allowance	(100x50%) 50	(160x 50%) 80
Contribution to provident fund	(150x10%) 15	(240x10%) 24
Contribution to Employee stock insurance	(150x4.75%) 7.125	(240x4.75%) 11.4
Total	**172.125**	**275.4**

Calculation of overtime wages

A = (Rs.150/200hrs) x 10hrs x 200% = Rs.15/-

Apportionment of worker A & worker B to different jobs like X, Y, Z.

Particulars	Job-X (Rs.)	Job-Y (Rs.)	Job-Z (Rs.)
Worker A	68.85	51.6375	51.6375
Worker B	137.7	55.08	82.62
Overtime	-	15	-
Total	**206.55**	**121.7175**	**134.2575**

PROBLEM NO: 3

Statement Showing Computation of Effective Hourly Rate/Cost:

Particulars	Amount (Rs.)
Salary (250 x 12)	3,000
Dearness Allowance (on 1st 100 = 400) (on 2nd 100 = 100) (on 3rd 100 = 25) 525 x 12	6,300
Salary + DA	9,300
ESI (4% of 9300)	372
EPF (8% of 9300)	744
Bonus (20% of 9300)	1860

Other Allowances		2725
TOTAL COST	**(A)**	**15,001**
Particulars		**Hours**
No. of Hours Worked	2400	
(-) Normal Idle Time	400	
NET PRODUCTIVE HOURS	**(B)**	2000
EFFECTIVEL HOURLY RATE (A/B)		7.5005/hr

Calculation of Sales Value:

Raw Materials (Equals to A's Earnings)	135
Labour Cost	135
Prime Cost	270
Overheads (100% of Prime Cost)	270
Cost of Production (90%)	540
Profit (10%)	60
Sales Value (100%)	600

WORKING NOTE:

Earnings of A:

No. of Effective Hrs.   =   18

Hourly Rate   =   7.50

Total Earnings   =   135/-

Note: Employee Contribution to PF & ESI are treated as Savings and not the Earnings of the Worker. So, not included in Total Labour Cost.

PROBLEM NO: 4

Calculation of wages on the basis of time

A = 40 hours x Rs. 75 per hour= Rs.3,000/-

B = 60 hours x Rs. 80 per hour= Rs.4,800/-

C = 44 hours x Rs. 50 per hour= Rs.2,200/-

     Rs.10,000/-

∴ Bonus amount   = Actual payment – Time wages

          = 15,000 - 10,000 = Rs.5,000/-

% of bonus = (5,000/10,000) x 100 = 50% on time wages

Statement showing the earnings per hour for each worker

Worker	Time basis wages (1) (Rs.)	Bonus (2) (Rs.)	Total (3)=(1)+(2) (Rs.)	Earnings per hour (Rs.)
A	3000	(3000 x 50%) 1500	4,500	(4500 / 40hrs) 112.5
B	4800	(4800 x 50%) 2400	7,200	(7200 / 60hrs) 120
C	2200	(2200 x 50%) 1100	3,300	(3300 / 44hrs) 75

PROBLEM NO: 5

Given Data

Rate per hour (R.P.H)   = Rs.6

Time allowed (T.A)   = 8 Hours

Time Taken (H.W)   = 6 Hours

Time Saved (T.S)   = 2 Hours

Earnings of a worker under Halsey system= (H.W x R.P.H) + (½) (T.S x R.P.H)

= (6 hrs x Rs.6) + (½) (2 hrs x Rs. 6)

= 36 + 6

= Rs.42/-

Earnings of a worker under Rowan scheme = (H.W x R.P.H) + (T.S/T.A) (H.W x R.P.H)

= (6 hrs x Rs. 6) + $\left(\dfrac{2\,hours}{8\,hours}\right)$(6hours $\times$ Rs. 6)

= 36 + 9

= Rs.45/-

Note:
H.W = Hours worked
R.P.H = Rate per Hour
T.S = Time Saved

PROBLEM NO: 6

From the given data

Time taken (No. of hours worked) = (9hrs + 9hrs + 9hrs + 9hrs + 4hrs) = 40 hrs

Time Allowed (No. of hours allowed) = 2000 units/40 units per hour

= 50hrs

∴ Time saved = Time allowed – Time Taken

= 50 hrs – 40 hrs

= 10 hrs.

Rate per hour (Given) = Rs.25/hour

Earnings of the worker under Halsey plan = (H.W x R.P.H) + (½) (T.S x R.P.H)

= (40 hours x Rs.25) + (½)(10 hours x Rs. 25)

= Rs. 1,000 + Rs. 125

= Rs.1,125

Earnings of the worker under Rowan plan = (H.W x R.P.H) + (T.S/T.A) (H.W x R.P.H)

= (40 hours x Rs. 25) + $\dfrac{10\,hours}{50\,hours}$ ×40 hours × Rs. 25

= Rs. 1,000 + Rs. 200 = Rs.1200

PROBLEM NO: 7

From the given data

Time taken = (9hrs + 9hrs + 9hrs + 9hrs + 9hrs + 5hrs)   = 50 hrs

Time allowed = Total units produced/No. of units allotted per hour

= 600 units/10 units

= 60 hours

∴ Time saved = Time allowed – Time taken

= 60 hrs – 50 hrs

= 10 hrs

∴ Bonus = 40 % of the time saved

= 40% x Time saved x rate per hour

= 40% x 10hrs x 0.5 per hour

= Rs.2

Total Earnings (wages) = (H.W x R.P.H) + 40% (T.S x R.P.H)

= (50 hrs x 0.5) + 40% (10 hrs x 0.5)

= 25 + 2

= Rs.27

Effective rate of earnings per hour = Total earnings/Hours worked

= Rs.27/50hrs

= Rs. 0.54 per hour

PROBLEM NO: 8

Calculation of extra output

Particulars	No. of units
a) Actual Output (Given)	800
b) Standard Output (80units x 8 hrs)	640
Extra output	160

∴ Bonus payable on 160 units

Bonus payable = 100 units + 60 units

$$= Rs.15 + \frac{60\,units}{100\,units} \times 15$$

= Rs.24/-

c) Total wages   = Rs.50 (Given) + Rs.24 (Bonus)

= Rs.74/-

d) Total wages under piece rate basis = (No. of pieces produced x Rate per piece)

= 800 units x Rs. 0.078125

= Rs. 62.5

e) **Calculation of time saved**

    1. Time allowed (standard) (800 units/ 80 units)   = 10 hrs

    2. Time taken   =   8 hrs

    3. Time saved   =   2 hrs (1 – 2)

f) Total Earnings under Halsey premium system = (H.W x R.P.H) + (½) (T.S x R.P.H)

                                    = (8 hrs x Rs 6.25) + (½) (2 x 6.25)

                                      = Rs.56.25

g) Total Earnings under Rowan premium system

= (H.W x R.P.H) + (T.S/T.A) (H.W x R.P.H)

$$= (8 \text{ hrs} \times Rs.6.25) + \frac{2\,hours}{10\,hours} \text{ (8 hours} \times Rs. 6.25)$$

= Rs.60/-

Note: Piece rate per piece = $\dfrac{\text{Wage for a definite period}}{\text{Standard output for the same definite period}}$

$$= \frac{Rs.50\,(8hrs)}{640\,units\,(8hrs)}$$

= Rs.0.078125

PROBLEM NO: 9

WORKING NOTE:

Calculation of time saved/ bonus hours

    i.   Time allowed (1250 units x 2 hrs)   = 2,500 hrs

    ii.   Time taken (8 hrs x 25 days x 10 workers) = 2,000 hrs

           Time saved/ bonus hours   =   500 hrs

a. **Calculation of effective rate of earnings per hour under Halsey scheme and rowan scheme**

Total Earnings under Halsey scheme	= (H.W x R.P.H) + (½) (T.S x R.P.H)
	= (2000 hrs x Rs. 2) + (½) (500 hrs x Rs. 2)
	= Rs.4,500
Effective hourly rate of earnings (Halsey)	= Total earnings/ time taken
	= Rs.4,500/2000 hrs
	= Rs.2.25 per hour
Total earnings under Rowan scheme	= (H.W x R.P.H) + (T.S/T.A) (H.W x R.P.H)
	= (2000 hrs x Rs. 2) + (500 hrs/2500 hrs) (2000 hrs x Rs. 2)
	= Rs.4,000 + Rs.800
	= Rs. 4,800
Effective hourly rate of earnings (Rowan)	= Total earnings/ time taken
	= Rs.4,800/2000 hrs
	= Rs. 2.4 per hour

b. **Calculation of actual amount paid under previous scheme**   = Time allowed x R.P.H

                                                                 = 2,500 hrs x Rs. 2

                                                                   = Rs. 5,000

Savings when Mr. A follows the Halsey scheme   = Rs.5,000 – Rs.4,500

        = Rs.500/-

Savings when Mr. A follows the Rowan scheme   = Rs.5,000 – Rs.4,800

        = Rs.200/-

Savings per unit under Halsey scheme = Rs.500/1250 units   = Rs.0.4 per unit

Savings per unit under Rowan scheme   = Rs.200/1250 units   = Rs.0.16 per unit

c. **Calculation of % of bonus given under Rowan scheme and Halsey scheme**

% of bonus given under Halsey scheme	= (Rs.500/Rs.4,000) x 100
	= 12.5% of Basic wages.
% of bonus given under Rowan scheme	= (Rs.800/Rs.4,000) x 100
	= 20% of Basic wages.

If Mr. A follows the Rowan scheme it satisfies the condition of 20% increase over the present earnings of the workers. So, it is advisable to Mr. A to follow the Rowan Scheme.

PROBLEM NO: 10

Actual output = 37 units

$$\text{Standard output} = \frac{8 \text{ hrs.} \times 60 \text{ minutes}}{12 \text{ minutes per piece}}$$

             = 40 units

$$\text{Efficiency} = \frac{37 \text{ units}}{40 \text{ units}} \times 100 = 92.5\%$$

Under Taylor's differential piece rate system, a worker is paid lower piece rate of 83%, since his efficiency is less than 100%.

Standard production per hour = 60 minutes/12 minutes = 5 units

Normal Rate per hour = ₹20

Normal piece rate per unit = ₹20/5 units = ₹4

Lower piece rate per unit = ₹4 × 83/100 = ₹3.32

Total earnings = 37 units × ₹3.32 = ₹122.84

PROBLEM NO: 11

Earnings of Workers under Straight Piece Rate System:

Worker A = 390 units × ₹ 0.09 = ₹ 35.10

Worker B = 450 units × ₹ 0.09 = ₹ 40.50

Worker C = 600 units × ₹ 0.09 = ₹ 54.00

Earnings of Workers under Merrick's Multiple Piece Rate System

Particulars	A	B	C
Efficiency level (Refer to working note ii)	81.25%	93.75%	125%
Applicable wage rate per unit	0.09	0.099	0.108*
Earnings (₹)	35.10 (390 units × 0.09)	44.55 (450 units × 0.099)	64.80 (600 units × 0.108)

Note : *Some author suggests an increase of 30% over normal piece rate at an efficiency level of 120% or more. In such a case the rate per unit would be Rs.0.117 and total earnings would come to Rs.70.20.

PROBLEM NO: 12

Calculation of earnings for workers under different incentive plan;

i. **Halsey premium plan**

Particulars	Worker A	Worker B
a. Actual time taken	40 hrs	40 hrs
b. Standard time	$\left(\dfrac{176\,pieces \times 15\,minutes}{60\,minutes}\right)$ 44 hrs	$\left(\dfrac{140\,pieces \times 15\,minutes}{60\,minutes}\right)$ 35 hrs
c. Minimum wages	(40hrs x Rs.40) Rs. 1,600	(40 hrs x Rs.40) Rs.1,600
d. Bonus	{(44 hrs – 40 hrs) 50% x Rs.40} Rs. 80	No Bonus
Earnings (Total)	**Rs. 1,680**	**Rs. 1,600**
ii. **Rowan's premium plan**		
Particulars	Worker A	Worker B
a. Minimum wages (same as above)	Rs.1,600	Rs.1,600
b. Bonus	{(4 hrs/44 hrs) x 40 hrs x Rs.40} Rs. 145.45	No Bonus
Earnings (Total)	**Rs. 1,745.45**	**Rs. 1,600**
iii. **Taylor's differential piece rate system**		
a. Efficiency	(176 pieces/ 160 pieces×100) 110%	(140pieces/160pieces×100) 87.5%
Earnings (Total)	(176 pieces x 10 x 120%) **Rs.2,112**	(140 pieces x 10 x 80%) **1,120**

iv.	Emerson's Efficiency plan		
a. Time wages (40hrsx 40)	Rs.1,600		Rs.1,600
b. Bonus	[40 hrs x 40x (20+10)%] Rs. 480		(Rs1,600 x 20%) Rs. 320
Earnings (Total)	**Rs. 2,080**		**Rs. 1,920**

PROBLEM NO: 13

Standard output   = 240 units (given)

Actual output   = 264 units (given)

Wage rate per hour   = Rs.10 per hour

Under Emerson Plan:

% of Efficiency   = (264 units/240 units) x 100 = 110%

% of total bonus   = 10%+20% = 30%

Total earnings   = 100%+30% = 130%

Total earnings   = 10 hrs x Rs. 10 x 130% = Rs.130

Total Bonus   = 10 hrs x Rs. 10 x 30% = Rs.30.

PROBLEM NO: 14

Statement showing bonus and earnings under Emerson Efficiency System

Workers	A	B	C
Actual output in units	25	40	45
Standard output in units	40	40	40
Efficiency level (%) $\left[\dfrac{\text{Actual output}}{\text{Standard output}} \times 100\right]$	62.5%	100%	112.50%
Rate of bonus on time wages	No bonus	20%	32.50% (20% + 12.5%)
Time wages (₹)	50	50	50
Bonus (₹)	Nil	10 (20% of ₹ 50)	16.25 (32.5% of ₹ 50)
Total earnings (₹)	**50**	**60**	**66.25**

PROBLEM NO: 15

Given Rate per hour   = Rs. 0.4 per unit,

Piece rate   = Rs. 0.3 per unit,

Standard production per hour   = 2 units

Time taken   = 40 hours

Standard production for 40 hours = 80 units (40 X 2)

Actual production for 40 hours (X) = 50 units

                            (Y) = 80 units

Particulars	Taylor Differential Piece Rate		Merrick Differential Piece Rate		Gantt's Task	
	X	Y	X	Y	X	Y
1. Earnings (W.N – 1)	12.45 (0.3×83%×50)	30 (0.3×125%×80)	15 (0.3×50)	26.4 (0.3×110%×80)	16 (40×0.4)	19.2 [16+(16×20%)]
2. Cost per piece	0.25 ($\frac{12.45}{50}$)	0.375 ($\frac{30}{80}$)	0.3 ($\frac{15}{50}$)	0.33 ($\frac{26.4}{80}$)	0.32 ($\frac{16}{50}$)	0.24 ($\frac{19.2}{80}$)

% of Efficiency $= \dfrac{\text{Actual production}}{\text{Standard production}} \times 100$

$X = \dfrac{50}{80} \times 100 = 62.5\%; \ Y = \dfrac{80}{80} \times 100 = 100\%$

PROBLEM NO: 16

Let 'y' be the wage rate per hour

Let 'x' be the cost of materials

Earnings

Under Halsey = (H.W x R.P.H) + (½) (T.S x R.P.H)

                    = (80hrs x y) + ½(20hrs × y)

                    = 90y

Under Rowan   = (H.W x R.P.H) + (T.S/T.A) (H.W x R.P.H)

                    = (60hrs x y) + (40/100)60hrs x y

                    = 84y

Statement showing factory cost of the worker Vishnu and Shiva

Particulars	Vishnu	Shiva
a. Cost of materials	x	x
b. Normal wages	84y	90y
c. factory overheads	600 (60 hours x Rs. 10)	800 (80 hours x Rs.10)
d. factory cost	x+84y+600	x+90y+800

From solved equation

X + 84y + 600 = 7280 - 1

X + 90y + 800 = 7600 - 2

(-) (-)   (-)   (-)

    - 6y – 200   = -320

        - 6y   = -320 + 200

        -6y   = -120

        y   = Rs.20

Substitute y = 20 in - 1

x + 84y + 600   = 7280

x + 84 (20) + 600 = 7280

        x   = 7280 – 2280

        x   = Rs.5000

Cost of Materials = Rs.5000]

Wage rate per hour = Rs.20

PROBLEM NO: 17

Given, Replacements = (No. of replacements/Avg no. of workers) = 5% → 1

Separations   = (No. of separations/Avg no. of workers) = 3% → 2

Flux   = (No. of replacements + No. of separations) / Avg no. of workers = 10% → 3

From (1) Average no of workers   = No of replacements / 5%

= 30 employees/5%

= 600 employees

From (2) No. of separations   = 3% x Average no. of workers

= 3% x 600 employees

No of workers left & discharged = 18 workers

From (3) (No. of separations + No. of accessions) / Avg no. of workers = 10%

18 + No. of accessions   = 10% x 600

No of accessions   = 60 -18

No of accessions   = 42 workers

No of workers joined & recruited   = 42 workers

PROBLEM NO: 18

Standard output   = (10,000 tonnes x 20 days) / 25 days = 8,000 tonnes

Actual output   = 11,000 tonnes

Excess output   = (11,000 tonnes - 8,000 tonnes) = 3,000 tonnes

% of excess output = 3,000 tonnes/8,000 tonnes = 37.5%

Group bonus = 3,000 x 10 = Rs.30,000/-

Statement showing bonus payable to each group (In Rs.)

Particulars	Direct labour (Rs.)	Inspection staff (Rs.)	Maintenance staff (Rs.)	Supervisor (Rs.)
a. Group Bonus 30,000 × (70%: 10%: 12%: 8%)	21,000	3,000	3,600	2,400
b. Bonus to direct labour (3,000 tonne x (17.5/37.5) x Rs.5	7,000	-	-	-
c. Penalty to IS staff (11,000 × 1% - 200 tonnes) × Rs. 20	-	(1,800)	-	-
d. Penalty to maintenance (40 hours x Rs.20)	-	-	(800)	-
Net bonus paid	28,000	1,200	2,800	2,400

THE END