

2. LABOUR

Problem.1

Calculate the earnings of A and B under Straight Piece Basis and Taylor's Differential Piece Rate System, from the following information.

Standard production	:	10 units per hour
Factory Day	:	8 hours
Normal time rate	:	50 paise per hour

Differential to be applied:

Mr. A produces 70 units in a day.
 Mr. B Produces 85 units in a day.
 80% of piece rate below standard
 120% of price rate of at or above standard

Solution

Normal Time rate = $0.5/H$ Standard work = 10 unit/H For 10 units wages = 0.5 For 1 unit = $\frac{0.5}{10} = 0.05 / \text{unit}$ Normal piece rate = 0.05/unit	
Straight piece rate	$A = 70 \times 0.05 = 3.5$
Wages	$B = 85 \times 0.05 = 4.25$
Difference piece rate	
Standard work for 8 hours	$= 8h \times 10 \text{ unit/h}$ $= 80 \text{ units}$
Efficiency rate	$= \frac{\text{Worksdone}}{\text{Standard workstobe done}} \times 100$ $A = \frac{70}{80} \times 100 = 87.5\%$ $B = \frac{85}{80} \times 100 = 106.25\%$
Wages	$A = (70 \times 0.05) \times 80\% = 2.8$ $B = (85 \times 0.05) \times 120\% = 5.1$

Problem.2

Find out the earnings of the workers on the basis of Merrick's Differential Piece-rate system from the following particulars:

Piece rate = 10 paise per unit Standard Production 120 units.
 Production of the workers:

X	90 units
Y	100 units
Z	130 units

Basic rate is guaranteed upto 83% of the standard production and workers get premium above 83% as follows:

Above 83% and upto 100%	110% of ordinary piece rate.
Above 100%	120% of ordinary piece rate.

Solution

Efficiency rate	$\frac{\text{Actual work}}{\text{Standard work}} \times 100$ $x = \frac{90}{120} \times 100 = 75\%$ $y = \frac{100}{120} \times 100 = 83.33\%$ $z = \frac{130}{120} \times 100 = 108.33\%$
Wages	$x = 90 \times (0.1 \times 100\%) = ₹ 9$ $y = 100 \times (0.1 \times 110\%) = ₹ 11$ $z = 130 \times (0.1 \times 120\%) = ₹ 15.6$

Problem.3

On the basis of the following information, calculate the earnings of A, B, C and D under Merrick Differential Piece Rate System:

Standard production per hour. : 12 units

Normal rate per units Re. 0.60

In an 8-hour day:

A produced	64 units	C produced	84 units
B produced	96 units	D produced	100 units

Solution

Statement Showing the Earnings of Workers as Per Merrick Differential Piece Rate System

Efficiency rate	$\frac{\text{Actual work}}{\text{Standard work}} \times 100$ $A = \frac{64}{96} \times 100 = 66.67\%$ $B = \frac{96}{96} \times 100 = 100\%$ $C = \frac{84}{96} \times 100 = 87.5\%$ $D = \frac{100}{96} \times 100 = 104.17\%$
Wages	$A = 64 \times (0.60 \times 100\%) = ₹ 38.4$ $B = 96 \times (0.6 \times 110\%) = ₹ 63.36$ $C = 84 \times (0.6 \times 110\%) = ₹ 55.44$ $D = 100 \times (0.6 \times 120\%) = ₹ 72$

Note: According to Merrick Differential Piece Rate System, different rates are applicable according to efficiency. The rates are as follows:

Efficiency	Applicable rate
Upto 83%	100% of ordinary piece rate.
Above 83% and upto 100%	110% of ordinary piece rate.
Above 100%	120% of ordinary piece rate.

Problem.4

Calculate the earnings of the workers A, B and C under Straight piece Rate System and Merricks multiple Piece Rate System from the following particulars:

Normal Rate per Hour	₹ 5.40
Standard Time per Unit	1 Minute
Output per day is as follows:	
Worker A -	390 Units
Worker B -	450 Units
Worker C -	600 Units
Working hours per day are 8.	

[May – 1998]

Solution Basic Calculations

1. Computation of Normal Wage Rate per unit :

Normal Rate per hour	₹ 5.40
Standard Output per hour	60 units
Normal Wage Rate per hour (₹ 5.40/60 units)	0.09P

Efficiency rate	$\frac{\text{Actual work}}{\text{Standard work}} \times 100$ $A = \frac{390}{480} \times 100 = 81.25\%$ $B = \frac{450}{480} \times 100 = 93.75\%$ $C = \frac{600}{480} \times 100 = 125\%$
Wages	$A = 390 \times (0.09 \times 100\%) = ₹ 35.1$ $B = 450 \times (0.09 \times 110\%) = ₹ 44.55$ $C = 600 \times (0.09 \times 120\%) = ₹ 64.8$

Problem.5

From the under mentioned information, work out the total amount payable and the rate earned per hour by three workmen under the Halsey Premium Bonus System; the Bonus being calculated at 50% of the time saved:

Standard Time for given operation: 10 hours; Hourly Rate of Wages: Re 1

Actual Time taken: B: 8 hours; C: 6 hours; D : 5 hours.

Solution	Total Earnings =	Time Taken × Hourly Rate + 50% of Time Saved × Hourly Rate
	For B	= 8 hours × Re. 1 + 50% × 2 hours × Re. 1 = ₹ 8 + Re. 1 = ₹ 9
	For C	= 6 hours × Re. 1 + 50% × 4 hours × Re. 1 = ₹ 6 + ₹ 2 = ₹ 8
	For D	= 5 hours × Re. 1 + 50% × 5 hours × Re. 1 = ₹ 5 + ₹ 2.50 = ₹ 7.50

Statement Showing Rate Earned Per Hour

	B	C	D
Total amount	₹ 9	₹ 8	₹ 7.50
Rate earned per hour	9/8 = ₹ 1.25	8/6 = ₹ 1.33	7.50/5 = ₹ 1.50

Calculation of time saved

	B	C	C
Standard time allowed	10H	10H	10H
Less: Actual time taken	8H	6H	5H
Time saved	2H	4H	5H

(A) Wages Cost Under Different System**Problem. 6**

From the Following Particulars you are required to work out the earnings of a worker for a week under:

- (a) Straight piece rate (b) Differential piece rate,
(c) Halsey premium Scheme (50% sharing) and (d) Rowan premium scheme

Weekly working hours 48 Normal time taken per piece 20 minute

Hourly wage rate Rs. 7.50 Normal output per week. 144 pieces

Piece rate per unit Rs. 3.00 Actual output for the week 150 Piece-rate.

Differential piece-rate 80% of piece- rate when output below normal and 120% of piece-rate when output above normal.

Solution Cost of Wages

- (a) **As Per Straight Piece Rate** = Actual units produced × price rate
= $150 \times 3 = 450$

- (b) **As Per Different Rate** Efficiency rate = $\frac{\text{Actual output}}{\text{Normal output}} \times 100$
= $\frac{150}{144} \times 100 = 104.167\%$

$$\text{Wages} = (150 \times 3 \times 120\%) = 540$$

- (c) **Halsey Premium Scheme** Normal time/piece = 20 minute

Normal time allowed for Actual production

$$= \frac{150 \times 20M}{60M} = 50Hr.$$

Less: Actual time taken = 48 Hr.

Time saved = 2 Hr.

$$\text{Wages} = (48H \times 7.5) + 50\% (2 \times 7.5)$$

$$= 360 + 7.5 = ₹ 367.5$$

$$\begin{aligned}
 \text{(d) Rowan Premium Scheme Wages} &= (AH \times H / R) + \frac{TS}{SH} \times (AH \times H / R) \\
 &= (48 \times 7.5) + \frac{2}{50} \times (48 \times 7.5) \\
 &= 360 + 14.4 = 374.4
 \end{aligned}$$

Problem.7

During first week of April, 1997 the workman Mr. Kalyan manufactures 300 articles. He receives wage for a guaranteed 48 hours week at the rate of ₹ 4 per hour. The estimated time to produce one article is 10 minutes and another incentive scheme the time allowed is increased by 20%. Calculate his gross wages according to:

- Piece work with a guaranteed weekly wage,
- Rowan premium bonus, and
- Halsey premium bonus: 50% to workman.

Solution

- (a) Std Time required × Time base rate

$$\begin{aligned}
 &= 12 \text{ minutes} \times \frac{\text{Rs.4/ Hours}}{60 \text{ Minutes}} \\
 &= ₹ 0.8/\text{unit}
 \end{aligned}$$

Where

Estimated time	10 minutes
+ Allowance for incentive	
10 × 20%	2 minutes
Std. time Allowed	12 minutes
(i) Piece rate wages	= 300 Articles × 0.8/U
	= 240
(ii) Guaranteed minute wages	
	= 48H × 4 = Rs. 192
Actual payment (higher of two)	= Rs. 240

- (b) Std Time allowed for

$$\begin{aligned}
 \text{Actual production} &= 300 \times \frac{12}{66} = 60Hr \\
 \text{Less: Actual time taken} &= 48 Hr. \\
 \text{Time saved} &= 12 H \\
 \text{Rowan System} &= \\
 \text{Wages} &= (AH \times HR) + \frac{TS}{SH} \times (AH \times HR) \\
 &= (48H \times 4) + \frac{12}{60} \times (48 \times 4) \\
 &= ₹ 230.40
 \end{aligned}$$

- (iii) Halsey Wages (48 × 4) + 50% (12H × 4) = 216.0

Problem.8

Calculate the earnings of a worker under (i) Halsey Plan; and (ii) Rowan Plan from the following particulars:

- (1) Hourly rate of wages guaranteed 50 paise per hour.
- (2) Standard time for producing one dozen articles -3 hours.
- (3) Actual time taken by the worker to produce 20 dozen articles-48 hours. [Nov – 1998]

Solution **Computation of Earnings of a Worker under Halsey Plan:**

$$\begin{aligned}
 \text{Earnings} &= \text{Hrs. worked} \times \text{Rate per hour} + (1/2 \text{ Time saved} \times \text{Rate per hour}) \\
 &= 48 \text{ hrs.} \times \text{Re. } 0.50 + 1/2 \times 12 \text{ hrs.} \times \text{Re. } 0.50 \\
 &= ₹ 24 + ₹ 3 = ₹ 27
 \end{aligned}$$

(i) Computation of Earnings of a worker under Rowan Plan:

$$\begin{aligned}
 \text{Earning} &= \text{Hours worked} \times \text{Rate per Hour} + \left(\frac{\text{Time Taken}}{\text{Time Allowed}} \times \text{Time saved} \times \text{rate per hour} \right) \\
 &= 48 \text{ hrs.} \times \text{Re. } 0.50 + \left(\frac{48}{60} \text{ hrs.} \times 12 \text{ hrs.} \times \text{Re. } 0.50 \right) \\
 &= ₹ 24 + ₹ 4.80 = ₹ 28.80
 \end{aligned}$$

Working Notes

1. Time allowed to produce 20 dozen articles
 Standard time allowed for producing one dozen articles 3 hours
 Standard time allowed for producing 20 dozen articles $3 \times 20 = 60$ hours
2. Time saved
 Standard time to produce 20 dozen articles 60 hours
 Actual time taken by the worker to produce 20 dozen articles 48 hours
 Time saved 12 hours

Problem.9

The time allowed for a job is 8 hours. The hourly rate is ₹8. Prepare a statement showing :

- (i) The bonus earned (ii) The total earnings of labour and (iii) Hourly earnings.

Under the Halsey system with 50% bonus for time saved and Rowan system for each hour saved progressively.

Solution**Statement under Halsey Sys**

Hours	Bonus	Total earning	Hourly
Saved	$50\%(TS \times R/H)$	$(AH \times HR) + \text{Bonus}$	Earning $(TW \div AH)$
1	$50\%(1 \times 8)=4$	$(7 \times 8) + 4 = 60$	$60 \div 7 = 8.57$
2	$50\%(2 \times 8)=8$	$(6 \times 8) + 8 = 56$	$56 \div 6 = 9.33$
3	$50\%(3 \times 8)=12$	$(5 \times 8) + 12 = 52$	$52 \div 5 = 10.4$
4	$50\%(4 \times 8)=16$	$(4 \times 8) + 16 = 48$	$48 \div 4 = 12$
5	$50\%(5 \times 8)=20$	$(3 \times 8) + 20 = 44$	$44 \div 3 = 14.6$
6	$50\%(6 \times 8)=24$	$(2 \times 8) + 24 = 40$	$40 \div 2 = 20$
7	$50\%(7 \times 8)=28$	$(1 \times 8) + 28 = 36$	$36 \div 1 = 36$

Statement under Rowan Sys

Hours	Bonus	Total earning	Hourly
Saved	$TS/SH (AH \times R/H)$	$(AH \times HR) + \text{Bonus}$	Earning
1	$1/8(7 \times 8)=7$	$(7 \times 8) + 7 = 63$	$\div 7 = 9$
2	$2/8(6 \times 8)=12$	$(6 \times 8) + 12 = 60$	$\div 6 = 10$
3	$3/8(5 \times 8)=15$	$(5 \times 8) + 15 = 55$	$\div 5 = 11$
4	$4/8(4 \times 8)=16$	$(4 \times 8) + 16 = 48$	$\div 4 = 12$
5	$5/8(3 \times 8)=15$	$(3 \times 8) + 15 = 39$	$\div 3 = 13$
6	$2/8(2 \times 8)=12$	$(2 \times 8) + 12 = 28$	$\div 2 = 14$
7	$7/8(1 \times 8)=7$	$(1 \times 8) + 7 = 15$	$\div 1 = 15$

Problem.10

Which is better plan out of Halsey 50 percent bonus scheme and Rowan bonus scheme for an efficient worker? In which situation the worker get same bonus in both schemes?

[May – 2010] 3 Marks

Solution Comparison between Halsey & Rowan

Situation	Effect
When time saved is less than 50% of Std. time	Bonus is more in Rowan plan
At 50% of time saved of Std. time	Bonus will be equal in both case
When time saved is more than 50% of Std. time	Bonus is more in Halsey plan

For more efficient workers (saving more than 50% of time), Halsey is a better plan.

Problem. 11

Mr. A is working by employing 10 skilled workers. He is considering the introduction of some incentive scheme either Halsey Scheme (with 50% bonus) or Rowan Scheme of wage payment for increasing the labour productivity to cope with the increased demand for the product by 25%. He feels that if the proposed incentive scheme could bring about an average 20% increase over the present earnings of the workers, it could act as sufficient incentive for them to produce more and he has accordingly given this assurance to the workers.

As a result of the assurance, the increase in productivity has been observed as revealed by the following figures for the current month:

Hourly rate of wages (guaranteed)	Rs. 2.00
Average time for producing 1 piece by one worker based on the previous performance (This may be taken as time allowed)	2 hours
No. of working days in the month	25
No. of working hours per day for each worker	8
Actual production during the month	1,250 units.

Required:

1. Calculate effective rate of earnings per hour under Halsey Scheme and Rowan Scheme.
2. Calculate the savings to Mr. A in terms of direct labour cost per piece under the schemes.
3. Advise Mr. A about the selection of the scheme to fulfill his assurance.

Solution

(i) Standard hour for one unit	=	24
Actual units produced 1,250 units 2h	=	2,500 h
Less: Actual time taken (25 days × 8h) × 10 workers		(2,000 h)
Time saved		500 h

Halsey	Total wages = $(2,000 \times 2) + 50\% (500 \text{ h} \times 2) = ₹ 4,500$ Effective earning per hour = $4,500/2,000 = ₹ 2.25/H$
Rowan	Total wages = $(2,000 \text{ h} \times ₹ 2) + 500/2,500 (2,000 \times 2) = ₹ 4,800$ Effective earning per hour = $₹ 4,800/2,000 = ₹ 2.4/H$

(ii) Statement showing saving per unit

	Halsey	Rowan
Cost/Piece under incentive scheme $4,500/1,250$ $4,800/1,250$	3.60	3.84
Less: Cost/piece as per part scheme $2\text{h} \times ₹ 2/H$	4.00	4.00
Saving per piece	0.40	0.16

As per saving Halsey Scheme is better because there is more saving in this scheme.

(ii) Increase in earning of workers/hour

Halsey =	$2.25 - 2.00$	=	0.25
	$\% = 0.25/2 \times 100$	=	12.5%
Rowan =	$2.4 - 2.00$	=	0.4
	$\% = 0.4/2 \times 100$	=	20%

Increase in production:

Actual production	1250 unit
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M: Production as per standard	<u>1000 unit</u>
Increase	<u>250</u>

$$\% = 250/1000 \times 100 = 25\%$$

Problem.12

ZED Limited is working by employing 50 skilled workers. It is considered the introduction of incentive scheme-either Halsey scheme (with 50% bonus) or Rowan scheme of wage payment for increasing the labour productivity to cope up the increasing demand for the product by 40%. It is believed that proposed incentive scheme could bring about an average 20% increase over the present earnings of the workers; it could act as sufficient incentive for them to produce more. Because of assurance, the increase in productivity has been observed as revealed by the figures for the month of April, 2004.

Hourly rate of wages (guaranteed)	₹ 30
Average time for producing one unit by one worker at the previous performance (This may be taken as time allowed)	1.975 hours
Number of working days in the month	24
Number of working hours per day of each worker	8
Actual production during the month	6,120 units

Required

- Calculate the effective rate of earnings under the Halsey scheme and the Rowan scheme.
- Calculate the savings to the ZED Limited in terms of direct labour cost per piece.
- Advise ZED Limited about the selection of the scheme to fulfill his assurance.

[May - 2004] (4+2+2=8 Marks)

Solution

1. Computation of time saved (in hours) per month

$$\begin{aligned}
 &= \text{Standard production time of 6,120 units} - \text{Actual time taken by the workers} \\
 &= (6,120 \text{ units} \times 1.975 \text{ hours}) - (24 \text{ days} \times 8 \text{ hrs per day} \times 50 \text{ skilled workers}) \\
 &= 12,087 \text{ hours} - 9,600 \text{ hours} \\
 &= 2,487 \text{ hours}
 \end{aligned}$$

2. Computation of bonus for time saved hours under Halsey and Rowan schemes

Bonus under Halsey Scheme (with 50% bonus)	$= \frac{1}{2} \times 2,487 \text{ hours} \times ₹30$ $= ₹ 37,305$
Bonus under Rowan Scheme	$= \frac{\text{Time saved}}{\text{Time allowed}} \times \text{Time taken} \times \text{Rate per hour}$ $= \frac{2,487 \text{ hours}}{12,087 \text{ hours}} \times 9,600 \text{ hours} \times ₹30$ $= ₹ 59,258.38$

3. Computation of effective rate of earnings under the Halsey and Rowan schemes

Total earnings (under Halsey scheme) (Refer to working note 2)	= Time wages + Bonus = (24 days × 8 hours × 50 skilled workers × ₹ 30) + ₹ 37,305 = ₹ 2,88,000 + ₹ 37,305 = ₹ 3,25,305
Total earnings (under Rowan scheme) (Refer to working note 2)	= Time wages + Bonus = ₹ 2,88,000 + ₹ 59,258.38 = ₹ 3,47,258.38
Effective rate of earnings per hour (under Halsey Plan)	(₹ 3,25,305/9,600 hrs.) = ₹ 33.89
Effective rate of earnings per hour (under Rowan Plan)	(₹ 3,47,258.38/ 9,600 hrs) = ₹ 36.17

(ii) **Savings to the ZED Ltd. in terms of direct labour cost per piece:**

	₹
Direct labour cost (per unit) under time wages system (1.975 hours per unit × ₹ 30)	59.25
Direct labour cost (per unit) under Halsey Plan (₹ 3,25,305/6, 120 units)	53.15
Direct labour cost (per unit) under Rowan Plan (₹ 3,47,258.38/6, 120 units)	56.74
Savings of direct labour cost under:	
Halsey Plan (₹ 59.25 - 53.15)	₹ 6.10
Rowan Plan (₹ 59.25 - 56.74)	₹ 2.51

(iii) **Advise to ZED Ltd: (about the selection of the scheme to fulfil assurance)**

Halsey scheme brings more savings to the management of ZED Ltd, over the present earnings of ₹ 2,88,000 but the other scheme viz Rowan fulfils the promise of 20% increase over the present earnings of ₹ 2,88,000 by paying 20.58% in the form of bonus. Hence Rowan Plan may be adopted.

Problem. 13

Wage negotiations are going on with the recognised Labour Union and the Management wants you as the Cost Accountant of the Company to formulate an incentive scheme with a view to increase productivity.

The case of three typical workers Achuta, Ananta and Govinda who produce respectively 180, 120 and 100 units of the company's product in a normal day of 8 hours is taken up for study.

Assuming that day wages would be guaranteed at 75 paise per hour and the piece rate would be based on a standard hourly output of 10 units, calculate the earnings of each of the three workers and the labour cost per 100 pieces under

- | | |
|-------------------------|------------------------|
| (i) Day wages, | (ii) Piece rate, |
| (iii) Halsey scheme and | (iv) The Rowan scheme, |

Also calculate under the above schemes the average cost of labour for the company to produce 100 pieces.

Solution**Computation of Earnings of each Worker and The Labour Cost per 100 Pieces under Different Wage Schemes****(i) Day Wages**

Name of workers	Day wages	Actual output (units)	Labour cost per 100 pieces
	₹		₹
Achyuta	6.00 (0.75×8 days)	180	3.33
Ananta	6.00	120	5.30
Govinda	6.00	100	6.00
Total	18.00	400	4.50

Average labour cost to produce 100 pieces:

$$= \frac{\text{Total wages paid}}{\text{Total output}} \times 100 = \frac{\text{Rs.18}}{400} \times 100 = \text{Rs.4.50}$$

Piece rate = Normal time wages

$$= 0.75\text{H}/10 \text{ unit per hour}$$

=

$$0.075/\text{U}$$

(ii) Piece Rate**Statement of total earning under piece rate**

Name of worker	Actual output (units)	Piece rate ₹	Wages earned ₹	Labour cost per 100 pieces ₹
Achyuta	180	0.075	13.50	7.50
Ananta	120	0.075	9.00	7.50
Govinda	100	0.075	7.50	7.50
Total	400		30.00	7.50

$$\text{Average labour cost to produce 100 pieces} = \frac{\text{Rs.30}}{400} \times 100 = \text{Rs. 7.50}$$

(iii) Halsey Scheme

Particulars	Achyuta	Ananta	Govinda
Actual production	180	120	100
Standard hours allowed @ 10 units per hour	180/10=18 hrs	120/10 = 12hrs	100/10 =10hrs
Less: Actual time taking	8hrs	8hrs	8hrs
Time Saved in hrs	10 hrs	4hrs	2hrs

Statements of Wages**Halsey Scheme**

Name of Worker	Wages	Labour Cost per 100 pieces
Achyuta	8 hrs × 0.75 + 50%(10 hrs × 0.75)= 9.75	$\frac{9.75}{180} \times 100 = 5.42$
Ananta	8 hrs × 0.75 + 50%(4 hrs × 0.75)= 7.5	$\frac{7.5}{120} \times 100 = 6.25$
Govinda	8 hrs × 0.75 + 50%(2 hrs × 0.75)= 6.75	$\frac{6.75}{100} \times 100 = 6.75$
	24.00	

$$\text{Average wages cost for 100 unit} = 24/400 \times 100 = ₹ 6.00$$

Rowan Scheme

Name of Worker	Wages	Labour Cost per 100 pieces
Achyuta	$8 \text{ hrs} \times 0.75 + \frac{10\text{Hrs}}{18\text{Hrs}}(8 \text{ hrs} \times 0.75) = 9.33$	$\frac{9.33}{180} \times 100 = 5.18$
Ananta	$8 \text{ hrs} \times 0.75 + \frac{4\text{Hrs}}{12\text{Hrs}}(8 \text{ hrs} \times 0.75) = 8.00$	$\frac{8}{120} \times 100 = 6.67$
Govinda	$8 \text{ hrs} \times 0.75 + \frac{2\text{Hrs}}{10\text{Hrs}}(8 \text{ hrs} \times 0.75) = 7.2$	$\frac{7.2}{100} \times 100 = 7.2$

Problem. 14

The standard hours of Job X is 100 hours. The Job has been completed by Amar in 60 hours. Akbar in 70 hours and Anthony in 95 hours. The bonus system applicable to the job is as follows:

Percentage of time saved**To Time allowed**

Saving upto 10%

From 11% to 20%

From 21% to 40%

From 41% to 100%

Bonus

10% of time saved

15% of time saved

20% of time saved

25% of time Saved

The rate of pay is ₹ 1 per hour. Calculate the total earnings of each worker and also the rate of earnings per hour. [Ans. Amar ₹ 66.50, ₹ 1.108; Akbar ₹ 74.50, ₹ 1.064; Anthony ₹ 95.50, ₹ 1.005]

Solution

$$\text{Amar} = (\text{AH} \times \text{R/H}) + \text{Bonus}$$

$$= (60\text{H} \times ₹ 1) + (10\text{H} \times 1) \times 10\% + (10\text{H} \times 1) \times 15\% + (20\text{H} \times 1) \times 20\%$$

$$= ₹ 66.5$$

$$\text{Akbar} = (70\text{H} \times 1) + (10\text{H} \times 1) \times 10\% + (10\text{H} \times 1) \times 15\% + (10 \times 1) \times 20\%$$

$$= ₹ 74.5$$

$$\text{Anthony} = (95 \times 1) + (5\text{H} \times 1) \times 10\% = ₹ 95.5$$

$$\text{Effective Earning /Hours} = \text{Total Wages/Total Hours}$$

$$\text{Amar} = \frac{66.6}{60\text{H}} = ₹ 1.108$$

$$\text{Akbar} = \frac{74.6}{70\text{H}} = ₹ 1.064$$

$$\text{Anthony} = \frac{95.5}{95} = ₹ 1.005$$

Problem. 15

Two workmen, Vishnu and Shiva produce the same product using the same material. Their normal wage rate is also the same, Vishnu is paid bonus according to the rowan system, while Shiva is Paid Bonus according to the Halsey System. The time allowed to make the product is 100 hours.

Vishnu takes 60 hours while Shiva takes 80 hours to complete the product. The factory overhead rate is ₹ 10 per man-hour actually worked. The factory cost for the product for Vishnu is ₹ 7,280 and for Shiva it is ₹ 7,600.

You are required:

- To find the normal rate of wages
- To find the cost of material
- To prepare a statement comparing the factory cost of the products as made by the two work men.

Solution

Let suppose total material cost = ₹ x

Labour hour rate = ₹ y

Statement of Cost

	Vishnu	Shiva
	Rowan	Halsey
Material cost	x	x
Labour (60H × x) + 40/100(60H × y) (60y + 24y)	84y	
80H × y + 50% (20H × y) (80y + 10y)		90y
Factory OH (AH × ₹10) (60 × 10) (80 × 10)	600	
		800
Total Fixed cost	7,280	7,600

$$x + 84y + 600 = 7,280 - (i)$$

$$x + 90y + 800 = 7,600 - (ii)$$

$$-6y - 200 = -320$$

$$-6y = -320 + 200$$

$$+6y = +120$$

$$y = 120/6 = 20$$

$$\text{Wages rate/H} = ₹ 20H$$

Putting the value of y in equal (i)

$$x + 84y + 600 = 7,280$$

$$x + (84 \times 20) + 600 = 7,280$$

$$x = 5,000$$

D material cost = ₹ 5,000

(iii)

Cost Sheet

	Vishnu	Shiva
Material cost	5,000	5,000
Labour (60 × 20) + 40/10(60 × 20)	1,680	
(80 × 20) + 50% (20 × 20)		1,800
Overheads	600	800
Total Fixed cost	7,280	7,600

Problem. 16

A skilled worker in XYZ Ltd. is paid a guaranteed wage rate of ₹ 30 per hour. The standard time per unit for a particular product is 4 hours. Mr. P, a machine man, has been paid wages under the Rowan Incentive Plan and he had earned an effective hourly rate of ₹ 37.50 on the manufacture of that particular product. What could have been his total earnings and effective hourly rate, had he been put on Halsey Incentive Scheme (50%)?

[Nov – 1999]

Solution

Since AH is not given therefore, it has to be calculated on the basis of other information

$$\frac{\text{Rowan scheme}}{\text{Effective hour rate}} = 37.5$$

$$\frac{\text{Total Wages}}{AH} = 37.5$$

$$\frac{(AH \times HR) + \frac{TS}{SH} (AH \times R / H)}{AH} = 37.5$$

Let suppose Actual hours is x

$$\frac{(x \times 30) + \frac{4-x}{4} (x \times 30)}{x} = 37.5$$

$$30x + 30x - 7.5x^2 = 37.5x$$

$$\text{Or } 60x - 37.5x = 7.5x^2$$

$$22.5 = 7.5$$

$$\therefore x = \frac{22.5}{7.5} = 3$$

(ii) **Rowan premium plan:**

$$\text{Wages} = (AH \times HR) + \frac{TS}{SH} (AH \times HR)$$

Total earnings and effective hourly rate of skilled worker (machine man P) under Halsey Incentive Scheme:

$$\begin{aligned}
 \text{Total earnings} &= \text{Hours worked} \times \text{Rate per Hour} \\
 &= (\text{under 50\% Halsey Incentive Scheme}) + \frac{1}{2} \text{ Time saved} \times \text{Rate per hour} \\
 &= 3 \text{ hours} \times \text{Rs. } 30 + \frac{1}{2} \times 1 \text{ hour} \times \text{Rs. } 30 \\
 &= \text{Rs. } 105
 \end{aligned}$$

$$\text{Effective hourly rate} = \frac{\text{Total earnings}}{\text{Hours taken}} = \frac{\text{Rs. } 105}{3 \text{ hour}} = ₹ 35$$

Problem. 17

The management of a company wants to formulate an incentive plan for the workers with a view to increase productivity. The following particulars have been extracted from the books of company.

Piece wage rate ₹ 10

Weekly working hours 40

Hourly wages rate ₹ 40 (guaranteed)

Standard/normal time taken per unit 15 minutes.

Actual output for a week:

Worker A 176 pieces

Worker B 140 pieces

Differential piece rate: 80% of piece rate when output below normal and 120% of piece rate when output above normal.

Under Halsey scheme, worker gets a bonus equal to 50% of Wages of time saved.

Calculate:

- Earning of workers under Halsey's and Rowan's premium scheme.
- Earning of workers under Taylor's differential piece rate system and Emerson's efficiency plan.

[May - 2012] 8 Marks

Solution

(i) Earning of workers under Halsey's Rowan's premium scheme:

Halsey's Premium Scheme

$$\text{Total wages} = (\text{AH} \times \text{HR}) + 50\% (\text{TS} \times \text{R/H})$$

$$\text{Worker A} = (40\text{h} \times 40) + 50\% (4 \times 40) = 1,680$$

$$\text{Worker B} = (40\text{h} \times 40) + \text{Nil} = 1,600$$

Rowan's Premium Scheme

$$\begin{aligned}
 \text{Wages} &= (\text{Actual hours} \times \text{Rate}) + \\
 &\quad \frac{\text{Actual hours}}{\text{Standard hours}} \times (\text{standard hours} - \text{Actual hours}) \times \text{Rate}
 \end{aligned}$$

$$\begin{aligned}
 \text{Worker A} &= (40 \text{ hrs} \times 40.00) + \frac{40}{44} \times (44 - 40) \times 40 \\
 &= 1,600 + 145.45 = ₹ 1,745.45
 \end{aligned}$$

Worker B $= 40 \text{ hrs} \times 40.00 = ₹ 1,600$ (Bonus can't be negative)

Calculation of standard hours

Standard time for actual product

$$176 \times \frac{15}{60} = 44$$

$$140 \times \frac{15}{60} = 35$$

Less: Actual hours taken	(40)	(40)
Time saved	4	-
Extra time	-	5

(ii) Earning of workers under Taylor's differential piece rate system & Emerson Efficiency plan.

Taylor's: Output below standard then 80% Piece Rate

Output above standard then 120% Piece Rate

$$\text{Normal output} = \frac{40 \text{ hours} \times 60 \text{ minutes}}{15 \text{ minutes}} = 160 \text{ pieces.}$$

$$\text{Worker A} = 176 \text{ pieces} \times (₹ 10.00 \times 120\%) \text{ (above normal)} = ₹ 2,112$$

$$\text{Worker B} = 140 \text{ pieces} \times (₹ 10.00 \times 80\%) \text{ (below normal)} = ₹ 1,120$$

Emerson's efficiency Plan

$$\text{Efficiency} \left(\frac{SH}{AH} \times 100 \right)$$

Worker A

$$\frac{44}{40} \times 100 = 110\%$$

Worker B

$$\frac{35}{40} \times 100 = 87.50\%$$

$$\text{Worker A} = (AH \times R) + 20\% \text{ Bonus} + 10\% \text{ Addition Bonus}$$

$$= (40 \times 40) + 30\% \text{ of } (40 \times 40)$$

$$= ₹ 2,080/- \text{ Since efficiency is above } 100\%, \text{ Bonus} = 20\% \text{ of Basic wage} + 1\% \text{ for each } 1\% \text{ increase in efficiency above } 100\%.$$

$$\text{Worker B} = (AH \times R) + 20\% \text{ Bonus}$$

$$= (40 \times 40) + 20\% (40 \times 40)$$

$$= ₹ 1,920/-$$

Since efficiency is above 66.6% & up to 100%, Bonus = degree of efficiency on the basis of Actual efficiency 66.6% of basic wages (subject to maximum 20%)

Actual Efficiency – 66.6 = 87.50% - 66.6 = 20.93%, subject to maximum 20%. Hence, 20% of basic wages.

Problem. 18

The existing incentive system of Alpha Limited is as under:

Normal working week 5 days of 8 hours each plus 3 late shifts of 3 hours each

Rate of Payment Day work: ₹ 160 per hour

Late shift: Rs. 225 per hour

Average output per operator for 49-hours week i.e. including 3 late shifts = 120 articles

In order to Increase output and eliminate overtime, it was decided to switch on to a system of payment by

results.

The following information is obtained:

Time-rate (as usual)	:	₹ 160 per hour
Basic time allowed for 15 articles:	:	5 hours
Piece-work rate	:	Add 20% to basic piece-rate
Premium Bonus	:	Add 50% to time.

Required

- (i) Prepare a Statement showing hours worked, weekly earnings, number of articles produced and labour cost per article for one operator under the following systems:

- Existing time-rate
- Straight piece-work
- Rowan system
- Halsey premium system

Assume that 135 articles are produced in a 40-hour/week under straight piece work, Rowan Premium system, and Halsey premium system above and worker earns half the time saved under Halsey premium system. [Nov - 2005]

Solution

Statement showing hours worked, weekly earnings, number of articles produced and labour cost per article under various wage system:-

Particulars (Scheme)	Hours Worked	Weekly Earning Rs.	No. of Articles produced	Labour Cost per Article ₹
(a) Existing time rate	49	8,425 (W. N. – 1)	120	70.21
(b) Straight piece-work	40	8,640 (W. N. – 2)	135	64.00
(c) Rowan system	40	9,007.41 (W. N. – 3)	135	66.72
(d) Halsey system	40	8,600 (W. N. – 4)	135	63.70

Working Notes

Existing time rate :-

Weekly wages	40 hrs. @ ₹ 160/hr.	=	6,400
	9 hrs. @ ₹ 225/hr.	=	<u>2,025</u>
			<u>8,425</u>

Price rate system :-

Basic time: 5 hours for 15 articles	
Cost of 15 articles at hourly rate of Rs. 160/hr.	= 800
Add 20%	<u>160</u>
	<u>960</u>
∴ Rate/article =	960 ÷ 15 = 64
& Earnings for the week	= 135 × 64 = 8,640

Rowan premium system:-

Basic time	= 5 hrs. for 15 articles
Add: 50% to time (i.e.) 2.5 hours for 15 articles	

Total time = 7.5 hrs. for 15 articles or 30 minutes/article

∴ Time allowed for 135 articles = 67.5 hrs.

& Actual time taken for 135 articles = 40 hrs.

$$\begin{aligned}\therefore \text{Earning} &= (40 \text{ hrs.} \times \text{Rs.}160) + \left[\frac{67.5 - 40}{67.5} \times 40 \times 160 \right] \\ &= \text{Rs. } 9,007.41\end{aligned}$$

$$\begin{aligned}\text{Halsey premium system: - Earning} &= (40 \times \text{Rs.}160) + \frac{1}{2}(67.5 - 40) \times \text{Rs.}160 \\ &= ₹ 8,600.\end{aligned}$$

Problem. 19

Two workmen, A and B produce the same product using the same material. A is paid bonus according to Halsey plan, while B is paid bonus according to Rowan plan. The time allowed to manufacture the product is 100 hours. A has taken 60 hours and B has taken 80 hours to complete the product. The normal hourly rate of wages of workman A is ₹ 24 per hour. The total earning of both the workers are same. Calculate normal hourly rate of wages of workman B. [May-2009] 2 Marks

Solution

$$\text{A's Total wages} = (60H \times 24) + 50\% (40H \times 24) = 1,920$$

B's wages (Rowan)

$$1920 = (80H \times x) + \frac{20}{100}(80 \times x)$$

$$1920 = 80x + 16x$$

$$\text{Or } x = \frac{1920}{96} = ₹ 20$$

$$\text{Normal wage rate of B} = ₹ 20$$

Problem. 20

You are given the following information of a worker:

- | | | | |
|--------|-------------------------------|---|---------------------------|
| (i) | Name of worker | : | X |
| (ii) | Ticket No. | : | 002 |
| (iii) | Work started | : | 1.4.11 at 8 am |
| (iv) | Work finished | : | 5.4.11 at 12 noon |
| (v) | Work allotted | : | Production of 2,160 units |
| (vi) | Work done and approved | : | 2000 units |
| (vii) | Time and units allowed | : | 40 units per hour |
| (viii) | Wage rate | : | ₹ 25 per hour |
| (ix) | Bonus in existing scheme | : | 40% of time saved |
| (x) | Worker X worked 9 hours a day | | |

Required

Calculate the remuneration of the worker on the following basis:

- (i) Halsey plan and
- (ii) Rowan plan

[May – 2011] 5 Marks

Solution Time allowed = $\frac{2,000 \text{ unit}}{40 \text{ units}} = 50 \text{ hours}$

Time worked

1.4.11	=	9 hours
2.4.11	=	9 hours
3.4.11	=	9 hours
4.4.11	=	9 hours
5.4.11	=	<u>4 hours</u>
	=	<u>40 hours</u>
Time Saved		<u>10 hours</u>

Remuneration of worker X under

(a) Halsey plan	=	Time wage rate + Bonus
	=	(40 hrs × 25/-) + (10 hrs × 50% × 25/-)
	=	1000 + 125/- = 1,125/-
(b) Rowan plan	=	Time wages rate + Bonus
	=	(40 hrs × 25/-) + $\left(\frac{40}{50} \times 10 \times 25/-\right)$
	=	1000/- + 200/- = 1200/-

Problem. 21

The finishing shop of a company employs 60 direct workers. Each worker is paid Rs.400 as wages per week of 40 hours. When necessary, overtime is worked up to a maximum of 15 hours per week per worker at time rate plus one-half as premium. The current output on an average is 6 units per man hour which may be regarded as standard output. If bonus scheme is introduced, it is expected that the output will increase to 8 units per man hour. The workers will, if necessary, continue to work overtime up to the specified limit although no premium will be paid.

The company is considering introduction of either Halsey Scheme or Rowan Scheme of wage incentive system. The budgeted weekly output is 19,200 units. The selling price is Rs.11 per unit and the direct material Cost is ₹ 8 per unit. The variable overheads amount to ₹ 0.50 per direct labour hour and the fixed overhead is ₹ 9,000 per week.

Prepare a Statement to show the effect on the Company's weekly Profit of the proposal to introduce (a) Halsey Scheme, and (b) Rowan Scheme. [May – 2002]

Solution

Calculation of total wages under the present scheme

Wage rate per hour per worker	=	$\frac{\text{Rs.400}}{40 \text{ hrs.}}$	=	₹ 10/hours
∴ Overtime rate per hr. per worker	=	Normal rate/hour + 50%		
	=	Rs. 10 + 50% of Rs. 10	=	₹ 15 per hour
Average current output/hour	=	6 units.		
∴ Hours to be worked for budgeted weekly output of 19,200 units	=	$\frac{19,200 \text{ units}}{6 \text{ units}}$	=	3,200 hours.
Total normal hours available in a week	=	No. of workers × Hours per week		
	=	60 workers × 40 hours		
	=	2,400 hours.		

Overtime hour required to be worked

$$= \text{Total hours to be worked} - \text{Total normal hours available}$$

$$= 3,200 \text{ Hrs.} - 2,400 \text{ hrs.} = 800 \text{ Hrs.}$$

Total Wages

Normal wages for total hrs. worked (3,200 hrs. $\times$ 10)	₹ 32,000
Add: Overtime premium (WN. 1) (Rs. 5 $\times$ 800 hrs.)	4,000
$\therefore$ Total Wages	<u>36,000</u>

Total wages under the proposed scheme:

Time allowed:

$$\begin{aligned} \text{For 6 units} &= 1 \text{ hour} \\ \therefore \text{For 19,200 units} &= \frac{19,200}{6} = 3,200 \text{ hrs.} \end{aligned}$$

Time taken:

$$\begin{aligned} 8 \text{ units need} &= 1 \text{ hour} \\ \therefore 19,200 \text{ units need } \frac{19,200}{8} &= 2,400 \text{ hours} \\ \therefore \text{Time saved} &= \text{Time allowed} - \text{Time taken} \\ &= 3,200 - 2,400 \\ &= 800 \text{ hrs.} \end{aligned}$$

Under Halsey:

$$\begin{aligned} \text{Total wages} &= \text{Normal wages} + \text{Bonus} \\ &= (\text{Time Taken} \times \text{Time Rate}) + (50\% \times \text{Time saved} \times \text{Time rate}) \\ &= (2,400 \times 10) + (50\% \times 800 \times 10) \\ &= 24,000 + 4,000 \\ &= ₹ 28,000 \end{aligned}$$

Under Rowan:

$$\begin{aligned} \text{Total wages} &= \text{Normal wages} + \text{Bonus} \\ &= (\text{Time Taken} \times \text{Time rate}) + \\ &\quad (\text{Time Saved} \times \frac{\text{Time Taken}}{\text{Time allowed}} \times \text{Time Rate}) \\ &= (2,400 \times 10) + \left(800 \times \frac{2,400}{3,200} \times 10 \right) \\ &= 24,000 + 6,000 \\ &= ₹ 30,000 \end{aligned}$$

Statement of Profit

Particulars	Present Scheme	Halsey Scheme	Rowan Scheme
Sales value @ Rs.11/unit on 19,200 units	2,11,200	2,11,200	2,11,200
Less: Direct Materials Consumed @ Rs.8 per unit on 19,200 units	(1,53,600)	(1,53,600)	(1,53,600)
Direct labour cost (Refer Above Workings)	(36,000)	(28,000)	(30,000)
Variable OH @ 0.5 per direct labour hours	(1,600)	(1,200)	(1,200)
$\therefore$ Contribution	20,000	28,400	26,400
Less: Fixed Overheads	(9,000)	(9,000)	(9,000)
Weekly Profit	11,000	19,400	17,400

Problem. 22

A skilled worker is paid a guaranteed wage rate of ₹ 120 per hour. The standard time allowed for a job is 6 hours. He took 5 hours to complete the job. He is paid wages under Rowan Incentive Plan.

Calculate his effective hourly rate of earnings under Rowan Incentive Plan.

- (i) Calculate his effective hourly rate of earnings under Rowan Incentive Plan.
 (ii) If the worker is placed under Halsey Incentive Scheme (50%) and he wants to maintain the same effective hourly rate of earnings, calculate the time in which he should complete the job.

[May - 2013] 6 Marks

Solution (i) **Effective Hourly Rate** = $\frac{\text{Total Earning}}{\text{Actual Hours}}$

$$= \frac{*700}{5 \text{ hrs}} = ₹ 140/\text{hrs}$$

***Calculation of total earning under Rowan Incentive Plan:-**

$$\begin{aligned} \text{Earning} &= (AH \times R) + \frac{AH}{SH} (SH - AH) \times R \\ &= (5 \text{ hrs} \times 120) + \frac{5}{6} (6 - 5) \times 120 \\ &= 600 + 100 = ₹ 700 \end{aligned}$$

(ii) Actual hours to maintain same effective Rate under Halsey Incentive scheme (50%)

$$\text{Bonus per hour} = 140 - 120 = ₹ 20/\text{hour}$$

$$\text{Bonus per hour} = \frac{50\% (SH - AH) \times 120}{AH}$$

$$20 = \frac{50\% (6 - AH) \times 120}{AH}$$

$$20 AH = 360 - 60AH$$

$$80 AH = 360$$

$$AH = \frac{360}{80} = 4.5 \text{ hours}$$

Problem. 23

In a factory the standard time allowed for completing a given task (50 units), is 8 hours. The guaranteed time wages are ₹ 20 per hour. If a task is completed in less than the standard time, the high rate of ₹ 4 per unit is payable. Calculate the wages of a worker, under the Gantt system, if he completes the task in (i) 10 hours; (ii) 8 hours, and (iii) in 6 hours. Also ascertain the comparative rate of earnings per hour under the three situations.

Solution

$$\text{Efficiency Ratio} = \frac{\text{Actual Unit}}{\text{Standard Unit}} \times 100$$

$$\frac{\text{Standard Unit}}{\text{Actual Hours}} \times 100$$

$$(i) \quad \frac{8H}{10H} \times 100 = 80\%$$

$$(ii) \quad \frac{8H}{8H} \times 100 = 100\%$$

$$(iii) \quad \frac{8H}{6H} \times 100 = 133.33\%$$

Total Wages:

$$(i) \quad 10 H \times ₹ 20 = ₹ 200$$

$$(ii) \quad (8H \times ₹ 20) + 20\% (8H \times 20) = ₹ 192$$

$$(iii) \quad 50 \text{ unit} \times 4 = ₹ 200.$$

$$\text{Effective hour rate} = \frac{\text{Total Wages}}{\text{Actual hour}}$$

$$(i) \quad \frac{200}{10H} = 20$$

$$(ii) \quad \frac{192}{8H} = 24$$

$$(iii) \quad \frac{200}{6H} = 33.33$$

Problem. 24

From the following information you are required to calculate the bonus and earnings under Emerson Efficiency System. The relevant information is as under:

Standard working hours	:	8 hours a day
Standard output per hour in units	:	5
Daily wage rate	:	₹ 50
Actual output in units Worker A		25 units

Worker B	40 units
Worker C	45 units

Solution

$$\text{Efficiency ratio} = \frac{\text{Actual unit}}{\text{Standard unit}} \times 100$$

$$A = \frac{25}{(8 \times 5)} \times 100 = 62.5\%$$

$$B = \frac{40}{40} \times 100 = 100\%$$

$$C = \frac{45}{40} \times 100 = 112.5\%$$

$$\text{Total wages} = (AH \times R/H) + \text{Bonus} + \text{Additional Bonus}$$

$$A = 8H \times 6.25 = ₹ 50$$

$$B = (8H \times 6.25) + 20\% (8 \times 6.25) = ₹ 60$$

$$C = (8H \times 6.25) + 20\% (8 \times 6.25) + 12.5\% (8 \times 6.25) = ₹ 66.25$$

Problem. 25

During audit of accounts of Kamala Company, your assistant found errors in the calculations of the wages of factory workers and he wants you to verify his work. He has extracted the following information:

- (i) The contract provides that the minimum wage for a worker is his base rate. It is also paid for downtimes i.e. the machine is under repair or the worker is without work. The standard work week is 40 hours. For overtime production, workers are paid 150 per cent of base rates.
- (ii) Straight Piece Work—The worker is paid at the rate of 20 paise per piece.
- (iii) Percentage Bonus Plan—Standard quantities of production per hour are established by the engineering department. The worker's average hourly production, determined from his total hours worked and his production, is divided by the standard quantity of production to determine his efficiency ratio. The efficiency ratio is then applied to his base rate to determine his hourly earnings for the period.
- (iv) Emerson Efficiency Plan—A minimum wages is paid for production upto 66 2/3% of standard output or efficiency. When the worker's production exceeds 66 2/3% of the standard output, he is paid bonus as per the following table:

Efficiency Level	Bonus
Up to 66 2/3	Nil
Above 66 2/3 to 79%	10%
80% — 99%	20%
100% — 125%	45%

Your assistant has produced the following schedule pertaining to certain workers of a weekly pay roll:

Workers	Wage Incentive Plan	Total Hours	Down Time Hours	Units Produced	Standard Units	Base Rate Rs.	Gross Wages as per Books Rs.
Rajesh	Straight piece work	40	5	400	-	1.80	85
Mohan	Straight piece work	46	-	455	-	1.80	95
John	Straight piece work	44	-	425	-	1.80	85
Harish	Percentage bonus plan	40	4	250	200	2.20	120
Mahesh	Emerson	40	-	240	300	2.10	93
Anil	(40 hours production)	40	-	600	500	2.00	126

*Total hours of Mohan include 6 overtime hours.

Prepare a schedule showing whether the above computation of worker's wages are correct or not. Give details. [May - 1999]

Solution

Minimum Wages (Gross Wages & Wages to be paid)

Workers	Wage Incentive Plan	Minimum Wages Rs.	Gross Wages computed as per Incentive Plan	Gross Wages as per book Rs.	Wages to be paid Maximum of: minimum and gross wages Rs.
Rajesh (WN 1)	Straight piece work	72.00	80.00	85	80.00
Mohan (WN 2)	Straight piece work	88.20	91.00	95	91.00
John (WN 3)	Straight piece work	82.80	85.00	85	85.00
Harish (WN 4)	Percentage bonus plan	88.00	110.00	120	110.00
Mahesh (WN 5)	Emerson	84.00	100.80	93	100.80
Anil (WN 6)	Emerson	80.00	116.00	126	116.00

Working Notes

- Minimum Wages for Rajesh = Total Normal Hours x Rate per hour
 $= 40 \text{ hours.} \times ₹ 1.80 = ₹ 72$
 Gross wages (computed) = No. of units $\times$ Rate per unit
 as per incentive plan = $400 \text{ units} \times ₹ 0.20$
 $= ₹ 80$
- Minimum Wages for Mohan = Total Normal Hours $\times$ Rate per hour
 + Overtime Hours $\times$ Overtime Rate per hour
 $= 40 \text{ hours} \times ₹ 1.80 + 6 \text{ hours} \times ₹ 2.70$
 $= ₹ 72 + ₹ 16.20 = ₹ 88.20$
 Gross Wages (Computed) = $455 \text{ units} \times ₹ 0.20$

	=	₹ 91.00 as per incentive plan
3. Minimum Wages for John	=	40 hours × ₹ 1.80 + 4 hours × ₹ 2.70
	=	₹ 72 + ₹ 10.80 = ₹ 82.80
Gross Wages (computed)	=	425 units × Re. 0.20
	=	Rs. 85 as per incentive plan
4. Minimum Wages for Harish	=	40 hours × ₹ 2.20 = ₹ 88
Efficiency of Worker	=	$\frac{\text{Actual Production per hour}}{\text{Standard Production per hour}} \times 100$
	=	$\frac{(250 \text{ units} / 40 \text{ hour})}{(200 \text{ units} / 40 \text{ hour})} \times 100 = 125\%$
Hourly Rate	=	Rate per hour × Efficiency of worker
Gross Wages Computed	=	₹ 2.20 × 125% = ₹ 2.75
(as per percentage bonus plan)	=	40 hours × Rs. 2.75 = ₹ 110
5. Minimum wages for Mahesh	=	40 hours × Rs 2.10 = ₹ 84
Efficiency of Worker	=	$\frac{(240 \text{ units} / 40 \text{ hour})}{(300 \text{ units} / 40 \text{ hour})} \times 100 = 80\%$
Bonus (as per Emerson's plan)	=	Total Minimum Wages × Bonus Percentage
	=	₹ 84 × 20% = ₹ 16.80
Gross Wages as per Emerson's Efficiency plan	=	Minimum Wages + Bonus
	=	₹ 84 + ₹ 16.80 = ₹ 100.80
6. Minimum Wages for Anil	=	40 hours × ₹ 2 = ₹ 80
Efficiency of worker	=	$\frac{600}{500} \times 100 = 120\%$
Bonus as per Emerson's plan	=	Rs. 80 × 45% = ₹ 36
Gross wages as per Emerson's Efficiency plan	=	₹ 80 + ₹ 36 = ₹ 116

Problem. 26

Standard output in 10 hours is 240 units; actual output in 10 hours is 264 units. Wages rate is Rs.10 per hour. Calculate the amount of bonus and total wages under Emerson Plan. [May – 2008]

Solution

Under Emerson's efficiency system minimum time wages are guaranteed But beyond a certain efficiency level, bonus in addition to minimum day. Wages is given under this plan for a performance above 100% efficiency is admissible in the given question.

$$\text{Labour efficiency is} = \frac{264}{240} \times 100\% = 110\%$$

$$[\text{labour efficiency}] = \frac{\text{Actual output}}{\text{Standard output}} \times 100\% = 110\%$$

$$\begin{array}{ll} \text{So the basic wages is 100\% i.e. } ₹ 10 \times 10 \text{ hour} & = 100 \\ \text{Bonus – 20\% (above 100\% efficiency)} & 20 \end{array}$$

Add – 1% for each increase in efficiency (i.e. 110-100)	10
Total wages	₹ 130
Basic Wages	₹ 100
Bonus	₹ 30

Problem. 27

An article passes through five hand operations as follows:

Operation No.	Time per article	Grade of worker	Wages rate per hour
1	15 Minutes	A	Re.0.65
2	25 Minutes	B	Re.0.50
3	10 Minutes	C	Re.0.40
4	30 Minutes	D	Re.0.35
5	20 Minutes	E	Re. 0.30

The factory works 40 hours per week and the production target is 600 dozens per week. Prepare a statement showing for each operation and in total the number of operators required, the labour cost per dozen and the total labour cost per week to produce the total targeted output.

Solution**Statement of Number of Operators Required and Labour Cost**

Operation No.	No. of Operators required*	Labour Cost of 600 dozens per week	Labour Cost per dozen
	(See Working Note)	₹	₹
1	45	1,170 (45 × 40 × 0.65p)	1.95 (₹ 1,170/600)
2	75	1,500 (75 × 40 × 0.50 p)	2.50 (₹ 1,500/600)
3	30	480 (30 × 40 × 0.40 p)	0.80 (₹ 480/600)
4	90	1,260 (90 × 40 × 0.35 p)	2.10 (₹ 1,260/600)
5	60	720 (60 × 40 × 0.30 p)	1.20 (₹ 720/600)
Total	300	5,130	8.55

Working Note**Statement of No. of Operators Required**

Operation No.	
1	$\frac{600 \text{ dozens} \times 12}{40} = 15 \times 60 = 45$
2	$\frac{600 \text{ dozens} \times 12}{40} = 25 \times 60 = 75$
3	$\frac{600 \text{ dozens} \times 12}{40} = 10 \times 60 = 30$
4	$\frac{600 \text{ dozens} \times 12}{40} = 30 \times 60 = 90$
5	$\frac{600 \text{ dozens} \times 12}{40} = 20 \times 60 = 60$

Group Scheme**Problem. 28**

A, B, and C were engaged on a group task for which a payment of Rs. 725 was to be made. A's time basis wages are Rs. 8 per day, B's ₹ 6 per day and C's ₹ 5 per day. A worked for 25 days; B worked for 30 days; and C for 40 days. Distribute the amount of ₹ 725 among the three workers.

Solution**Statement of wages**

	Time base wages	Bonus	Total
A	25 day $\times$ 8 = 200	$145 \times 200/580 = 50$	250
B	30 day $\times$ 6 = 180	$145 \times 180/580 = 45$	225
C	40 day $\times$ 5 = 200	$145 \times 200/580 = 50$	250
	580	145	725

$$\text{Bonus} = 725 - 580 = 145$$

Since nothing is given, therefore Bonus should be distributed in time base wages ratio.

Problem. 29

In a factory Group Bonus system is in use which is calculated on the basis of earnings under time rate. The following particulars are available for a group of 4 workers P, Q, R, and S.

- (i) Output of the group. 16,000 units
- (ii) Piece rate per 100 units. ₹ 2.50
- (iii) No. of hours worked by

P. 90	Q. 72
R. 80	S. 100
- (iv) Time rate per hour for

P = ₹ 0.80	Q = ₹ 1.00
R = ₹ 1.20	S = ₹ 0.80

Calculate the total of Bonus and wages earned by each worker.

Solution**Computation of Total Wages & Bonus Earned by each worker**

Worker	Time	Wages	Bonus	Total Wages & Bonus
	Hrs. $\times$ Rate	(₹)	(₹)	(WN2)
P	90 $\times$ ₹ 0.80	72.00	18	90
Q	72 $\times$ ₹ 1.0	72.00	18	90
R	80 $\times$ ₹ 1.20	96.00	24	120
S	100 $\times$ ₹ 0.80	<u>80.00</u>	<u>20</u>	<u>100</u>
Total		320.00	80	400

Working Notes

1. Total piece earning of the group Rs. $1,600 / 100 \times 2.50 = \text{Rs. } 400.00$
2. Total Bonus Rs. $400 - ₹ 320 = ₹ 80$ divided in the ratio of time wages.

$$\begin{array}{rcl} & 80 & \\ \text{P} & \frac{\text{---}}{320} \times 72 & = 18 \end{array}$$

$$\begin{array}{rcl} & 80 & \\ \text{Q} & \frac{\text{---}}{320} \times 72 & = 18 \end{array}$$

$$\begin{array}{rcl}
 \text{R} & \frac{\text{---}}{320} \times 96 & = 24 \\
 & 80 & \\
 \text{S} & \frac{\text{---}}{320} \times 80 & = 20 \\
 & 320 & \\
 \text{Total ₹} & & \underline{80}
 \end{array}$$

Problem. 30

Ten men work as a group when the weekly production of the group exceeds standard (400 pieces per hour) each man in the group is paid a bonus for the excess production in addition to his wages at hourly rates.

The percentage of production in excess of the standard amount is found and half of this percentage is considered as the worker share. Each man in the group is paid as a bonus of this percentage of an average wage rate of ₹ 4.80 per hour. There is no relationship between the individual workmans hourly rate and the bonus rate. The following is one week production record

	Labour hours worked	Production (pieces)
Monday	90	44,200
Tuesday	88	45,200
Wednesday	90	48,400
Thursday	84	40,200
Friday	88	40,800
Saturday	<u>40</u>	<u>20,240</u>
Total	480	2,39,040

On the basis of the above production record Compute

- The Bonus rate per hour and amount of Bonus for the week
- The total pay of Antony who worked for 41 ½ hour, and was paid ₹ 4 per hour basic and of Smith who worked for 44 ¼ hour and was paid ₹ 5 hour basic.
- How much is the labour bonus Cost be attached to each unit of the week production.

Solution

- $$\begin{array}{rcl}
 \text{Actual production} & = & 2,39,040 \\
 \text{Standard production} & = & 1,92,000 \\
 (400 \text{ unit} \times 480\text{H}) & = & \\
 \text{Extra production} & = & 47,040 \\
 \% \text{ of extra production} & = & \frac{47,040}{1,92,000} \times 100 \\
 & = & 24.5\%
 \end{array}$$
- $$\text{Bonus share} = 24.5 \times \frac{1}{2} = 12.25\%$$
- $$\text{Bonus rate/H} = 12.25\% \times 4.8 = ₹ 0.588$$
- $$\text{Bonus has no concern with Actual hours rate}$$

$$(a) \text{ Bonus/H} = 0.588$$

Total amount of Bonus for week

$$= 0.588 \times 480 = ₹ 282.24$$

(b) Antony's total wages

$$= (41.5H \times 4) + (41.5 \times 0.588)$$

$$= ₹ 190.402$$

$$\text{Smith} = (44.25H \times 0.588)$$

$$= 247.269$$

$$\begin{aligned} \text{(c) Bonus/unit cost} &= \frac{282.24}{2,390 \text{ unit}} \\ &= 0.0048/\text{unit} \end{aligned}$$

Problem. 31

A manufacturer introduces new machinery into his factory with the result that production per worker is increased. The workers are paid by results and it is agreed that for every 2% increase in average individual output, an increase of 1% on the rate of wages will be paid. At the time the machinery is installed, the selling price of the products falls by $8\frac{1}{3}\%$.

Show the net saving in production costs which would be required to offset the losses expected from reduced turnover and bonus paid to workers.

	1st period	2nd period
Number of workers	175	125
Number of articles produced	8,400	7,000
Wages paid	₹16,800	
Total Sales	₹ 37,800	

Solution

$$\begin{aligned} \text{(i) Reduction in sales due to reduction in S.P.} &= \left[\frac{37,800}{8,400 \text{ units}} \times 7,000 \right] \times 8.33 \\ &= 2,624 \end{aligned}$$

Bonus Paid

Production/worker in New scheme

$$= \frac{7,000 \text{ unit}}{125 \text{ worker}} = 56 \text{ unit}$$

Production Unit/worker in Old scheme

$$\begin{aligned} &= \frac{8,400 \text{ unit}}{175 \text{ worker}} = 48 \text{ unit} \\ &= 8 \text{ units} \end{aligned}$$

$$\% \text{ Increase} = \frac{8}{48} \times 100 = 16.67$$

Bonus rate = 1% for every 2%

Therefore for 16.67% increase should be 8%

$$\text{Bonus payable} = \left[\frac{16,800}{8,400} \right] \times 8\% \times 7,000 \text{ unit} = ₹ 1,120$$

$$\begin{aligned} \text{Total saving in production cost required} &= ₹ 2,624 + ₹ 1,120 \\ &= ₹ 3,744 \end{aligned}$$

Problem.32

The present output details of a manufacturing department are as follows:

Average output per week	48,000 units from 160 employees
Saleable value of output	₹ 6,00,000
Contribution made by output towards	
Fixed Expenses and profit	₹ 2,40,000

The Board of Directors plans to introduce more mechanization into department at a capital cost of ₹ 1,60,000. The effect of this will be to reduce the number of employees to 120, and increasing the output per individual employee by 60%. To provide the necessary incentive to achieve the increased output, The Board intends to offer a 1% increase on the piece work rate of Re.1 per units for every 2% increase in average individual output achieved.

To sell the increased output, it will be necessary to decrease the selling price by 4%.

Calculate the extra weekly contribution resulting from the proposed change and evaluate for the Board's information, the desirability of introducing the change. [Nov – 2000]

Solution

Income Statement

Particulars	Current	Proposed
No. of unit	48,000	57,600
S.P.	12.5	12
Total Sales	6,00,000	6,91,200
Less: Mat. Labour & Variable 3,60,000/48,000 × 57,000	(3,60,000)	(4,32,000)
Less: extra Bonus		(17,280)
Contribution	2,40,000	2,41,920
Increase in contribution		1,920

Desirability: Increase in contribution therefore accept.

Working Note.1

$$\text{No. of unit} = \left(\frac{48,000 \text{ unit}}{160 \text{ unit}} \times 120 \text{ worker} \times 160\% \right) = 57,600 \text{ unit}$$

$$\text{Reduce Selling Price} = 12.5 \times 96\% = 12$$

Working Note.2

Increase in efficiency	60%
Bonus rate	30%
Bonus = (57,600 unit × 1,130%)	= ₹ 17,280

Problem. 33

Jobs are issued to operator A to make 300 units and to operator B to make 200 units for which allowed time is 12 minutes and 15 minutes per unit respectively.

Bonus is paid at 50% of the basic rate, which is ₹ 4 per hour, for every hour saved. The working hours per week are 45. Overtime is paid at double the normal rate.

A completes the work in 50 hours and B in 44 hours but entitled to full week's wages. 6 units were found defective from A's production and 4 units from B's production which were subsequently rejected but all units produced are paid for.

You are required to calculate:

(i) The amount of bonus payable; (ii) The gross wages payable; (iii) The labour cost per unit of saleable units produced.

Solution (i)

	A	B
Units	300	200
Standard time/unit	12M	15M
Total Standard time allowed for Actual Production $300 \times 12M/60M$	60H	
$200 \times 15/60$		50H
Less : Actual time	50H	44H
Time saved	10H	6H
Bonus = 50% (TS $\times$ H/R)		
= 50% (10H $\times$ 4)	20	
= 50% (6h $\times$ 4)		12

(ii) Gross wages payable

$$A = (50h \times 4) + 20 + (50 - 45) 4 \times 100\% = 240$$

$$B = (44h \times 4) + 12 + 1 h \times 4 = 192$$

(iii) Labour cost/unit of saleable units

$$A = \frac{240}{(300 - 6)} = ₹ 0.82$$

$$B = \frac{192}{(200 - 4)} = ₹ 0.98$$

(B) Overtime**Problem. 34**

It is seen from the job card for repair of the customers equipment that a total of 154 hours have been put in as detailed below :

	Worker 'A' paid at ₹ 2/- per day of 8 hours	Worker 'B' paid at Re. 1/- per day of 8 hours	supervisory worker 'C' paid of ₹ 3/- per day of 8 hours
Monday	10-1/2 hours	8 hours	10-1/2 hours
Tuesday	8 "	8 "	8 "
Wednesday	10-1/2 hours	8 "	10-1/2 hours
Thursday	9-1/2 "	8 "	9-1/2 "
Friday	10-1/2 "	8 "	10-1/2 "
Saturday	—	8 "	8 "
Total	49 hours	48 hours	57 hours

In terms of an award in a Labour conciliation, the workers are to be paid dearness allowance on the basis of cost of living index figures relating to each month which works out @ ₹ 96 for the relevant month. The dearness allowance is payable to all workers irrespective of wage rate if they are present or are on leave with wages on all working days.

Sunday is a weekly holiday and each worker has to work for 8 hours on all week days and 4 hours on Saturdays; the workers are however paid full wages for Saturday (8 hours for 4 hours worked).

Workers are paid overtime according to the Factories act 1948 for hours worked in excess of normal working hours on each day. Excluding holidays (including 4 hours work to be put in on Saturday) the total number of hours work out to 192 in the relevant month. The company, contribution to Provident Fund and Employees State Insurance Premium are absorbed into overheads.

Work out the wages payable to each worker.

Solution

(1) **Worker A** will get normal wages for 44 hours and overtime for 5 hours.

Worker B will get wages for 52 hours i.e. actually worked plus 4 hours worked extra on Saturday.

Worker C will get wages for 66 hours-the same as for A till Friday plus 12 hours for work on Saturday.

(a) Wages payable:

	A	B	C
Basic Wages per hour	₹ 0.250	0.125	0.375
Dearness allowance per hour	₹ 0.500	0.500	0.500
Hourly rate	₹ 0.750	0.625	0.875
Normal hours	44	52	48 + 4
Overtime hours	5	—	9H
Normal wages	₹ 33.00	₹ 32.50	45.5
Overtime wages	₹ 7.50	32.50	15.75
	40.50	32.50	61.25

Problem. 35

A company's basic wage rate is Rs. 0.75 per hour and its overtime rates are:

Evenings : Time and one-third

Week ends : Double Time

During the previous year the following hours were worked:

Normal time	2,20,000 clock hours
Time plus one-third	20,000 clock hours
Double time	10,000 clock hours

The following times have been worked on these jobs :

	Job A	Job B	Job C
	Clock hrs.	Clock hrs.	Clock hrs.
Normal time	3,000	5,000	4,000
Evening overtime	300	600	1,050
Week-end overtime	100	50	300

You are required to calculate the labour cost chargeable to each job in each of the following circumstances:

- Where overtime is worked regularly throughout the year as company policy due to labour shortage.
- Where overtime is worked irregularly to meet the production requirements.
- Where overtime is worked specifically at the customer's request to expedite delivery.

Solution

Basic wage rate Re 0.75 per hour Week-end overtime ₹ 1.50 per hour
 Evening overtime Re 1 per hour

Statement of Wages for the Previous Year

Normal time	2,20,000 hours	@ Re. 0.75 per hour	₹ 1,65,000
Evening time	20,000 hours	@ Re. 1 per hour	20,000
Week-end overtime	10,000 hours	@ Rs. 1.50 per hour	15,000
Total hours	2,50,000	Total wages	2,00,000

Average cost per hour = $2,00,000 / 2,50,000 = \text{Re. .80 per hour}$

- (a) Where overtime is worked regularly, it will be taken as a part of the cost of the job.

Job A 3,400 hours @ Re .80 per hour ₹ 2,720

Job B 5,650 hours @ Re .80 per hour 4,520

Job C 5,350 hours @ Re .80 per hour 4,280

- (b) (i) Where overtime is worked irregularly, to meet production requirements it will be charged as works overhead:

	Evening overhead	Week-end overhead	Total
Job A	$300 \times .25 = ₹ 75.00$	$100 \times .75 = ₹ 75.00$	150
Job B	$600 \times .25 = ₹ 150.00$	$50 \times .75 = ₹ 37.50$	187.50
Job C	$1,050 \times .25 = ₹ 262.50$	$300 \times .75 = ₹ 225.0$	487.50
Total	₹ 487.50	₹ 337.50	825.00

- (ii) The following amounts will be charged as labour cost:

Job A 3,400 hours @ Re 0.75 per hour	₹ 2,550.00
Job B 5,650 hours @ Re 0.75 per hour	₹ 4,237.50
Job C 5,350 hours @ Re 0.75 per hour	₹ 4,012.50
Total	₹ 10,800.00

- (c) Where overtime is worked specifically at the customer's request to expedite delivery, it will be charged directly to the jobs.

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Job A:	3,000 hours	@ Re. 75 per hour	₹2,250
	300 hours	@ Re 1.00 per hour	300
	100 hours	@ ₹ 1.50 per hour	150
			<u>₹ 2,700</u>
Job B:	5,000 hours	@ Re. 75 per hour	₹ 3,750
	600 hours	@ Re 1.00 per hour	600
	50 hours	@ ₹ 1.50 per hour	75
			<u>₹ 4,425</u>
Job C:	4,000 hours	@ Re .75perhour	₹ 3,000
	1,050 hours	@ Re 1.00 per hour	1,050
	300 hours	@ ₹1.50 per hour	450
	Total		<u>₹ 4,500</u>

Problem. 36

Following are the particulars for April, 1996 relating to four employees working in Department M of a factory, exclusively for Job No.120:

Name	Designation	Wages (₹)	Per
A	Foreman	800	month
B	Mechanic	15	day
C	Machine Operator	12	day
D	Workman	10	day

The normal working hours per week of six days are 48 or 8 hours per day. Sundays are paid holidays. There were no other holidays during the month.

Provident Fund contribution was 8% of monthly wages by employee.

Employee State Insurance Contribution was 3% of monthly wages by employee and 5% of monthly wages by employer.

From the foregoing data, calculate:

- Net wages payable by the employer for the month;
- The total amount of Provident Fund Contribution to be deposited by employer;
- Employee State Insurance Contribution to be deposited by the employer;
- Total labour cost to the employer for the month of April, chargeable to the job; and

Solution

(a) Calculation of Net Wages Payable for the month

Gross Wages for April, 1996:		₹	
A	Foreman @ ₹. 800 p.m.	800	
B	Mechanic @ ₹ 15 per day × 30 days	450	
C	Machine Operator @ ₹ 12 per day × 30 days	360	
D	Workman @ ₹ 10 per day × 30 days	<u>300</u>	1,910.00
Less: Deductions:			
(i)	Provident Fund Contribution @ 8% of Rs. 1,910 by employees	152.80	
(ii)	E.S.I. Contribution @ 3% of ₹ 1,910 by employees	<u>57.30</u>	(210.10)
Net Wages payable			1699.90

- | | | |
|-----|--|----------|
| (b) | Employer's share of Provident Fund (8% of Rs. 1,910) | ₹ 152.80 |
| | Employee's share of provident fund (8% of Rs. 1,910) | 152.80 |

Total amount of Provident Fund Contribution to be deposited by employer (both contributions)		305.60
(c)	Employer's Share of ESI (5% of ₹ 1,910)	₹ 95.50
	Employer's Share of ESI (3% of ₹ 1,910)	57.30
	ESI Contribution to be deposited by employer (both contributions)	152.80
(d)	Total Labour cost to employer:	
	Total Gross Wages	₹ 1,910.00
	Add: Employer's contribution towards P.F.	152.80
	Employer's contribution towards ESI	95.50
		<u>2,158.30</u>

Problem. 37

'X' an employee of ABC Co. gets the following emoluments and benefits:

(a)	Basic pay	₹ 1,000 p.m.
(b)	Dearness allowance	₹ 200 p.m.
(c)	Bonus	20% of Salary and D.A.
(d)	Other allowances	₹ 250 p.m.
(e)	Employee's contribution to P.F.	10% of salary and D.A

'X' works for 2,400 hours per annum, out of which 400 hours are non-productive and treated as normal idle time. You are required to find out the effective hourly cost of employee 'X'.

Solution

Statement showing computation of effective hourly cost of employee 'X'.

(i)	Earning of Employee 'X':	Per month ₹	Per Annum ₹
	Basic Pay	1,000	12,000
	Dearness Allowance	200	2,400
	Bonus	240	2,880
	Employer's contribution to provided fund	120	1,440
	Other allowance	250	3,000
		<u>1,810</u>	<u>21,720</u>
(ii)	Effective working hours:		
	Annual working hours		2,400
	Less: Normal idle time		(400)
	Effective working hours		2,000
	Effective hourly cost of 'X': ₹ 21,720/2,000		10.86

Problem. 38

The following particulars relate to the year ending on 31st March, 1997 for 30 workers

	₹		₹
Basic Wage	50,000	Recovery towards House Rent	10,200
Dearness Allowance	25,000	Recovery towards Supply of Provision	16,000
Night Shift Allowance	9,600	Expenses incurred for amenities to employees	4,730
Overtime Allowance	7,000		
Bonus 20% on wages			
P. F. deposit for the period	12,000		
E. S. I. Contribution(both)	2,808		

P. F. is paid in equal shares by the employer and the employees. The contribution to E. S. I. is in the proportion of 7 : 5 by the employer and the employees respectively. The workers are entitled to 5% of the total days worked as leave on full pay. The number of days worked in the year is 300. Normal idle time is 5%.

Assuming that all items are evenly spread over all the days in the year, ascertain the wages-cost per hour, the daily hours worked being eight.

Solution**I. Statement of Net Earnings**

Particulars	₹
Basic pay	50,000
DA	25,000
	75,000
Night Shift allowance assumed	9,600
OT Allowance (Normal)	7,000
Bonus (75,000 × 20%)	15,000
Gross Earning	1,06,600
Deduction	(6,000)
Employees contribution to P F (12,000 × ½)	(1,170)
G.S.I contribution by Employee (2,808 × 5/12)	99,430
Recovery towards house rent	(10,200)
Recovery towards supply of provision	(16,000)
Net Earning	73,230

II. Statement of Total Wages Cost

Particulars	₹
Basic pay	50,000
DA	25,000
	75,000
Night Shift allowance assumed	9,600
OT Allowance	7,000
Bonus	15,000
Gross Earning	1,06,600
(+) Employers contribution to P.F. (12,000 × ½)	6,000
(+) Employers contribution to E.S.I (2,808 × 7/12)	1,638
(+) Exp. Incurred for amenities	4,730
Total wages cost (a)	1,18,968
Effective hours (b)	64,980
Wages Cost/Hours (a/b)	1.830

Working Note:

Effective days

Total working days = 300

(-) Leave with pay = 15

285

Total working hours	=	$8H \times 30 \times 285 = 68,400$
Less : Normal idle 5%		<u>(3,420)</u>
Total effective hours		<u>64,980</u>

Problem. 39

The following data are related to the worker 'P':

Basic pay	₹ 200 p.m.
D. A.	₹ 150 p.m.
Fringe benefits	₹100 p.m.

No of working days in a year 300. 30 days full pay and 20 days half pay leave in a year is availed and allowed. Assume 8 hours day.

Calculate:

- (a) Labour Hour rate of worker 'P'?
 (b) What would be the effect on hourly rate if only 30 days full pay leave is allowed and availed?

Solution

Particulars	₹
Basic pay 200×12	2,400
DA 150×12	1,800
Fringe Benefit 100×12	1,200
	<u>5,400</u>
In deduction	
→ Leave with full pay	Nil
→ Leave with $\frac{1}{2}$ pay	
$\frac{5,400}{300} \times (20 \times 50\%)$	<u>180</u>
	5,220
Effective hours	2,000
(i) Labour hour rate of P	2.61 per hour
(ii) Labour hour Rate when 30 days full pay leave is allowed & availed	<u>5,400</u>
	$\frac{5,400}{270 \times 8}$
	= 2.5 per hour

Problem. 40

In a factory working six days in a week and eight hours each day, a worker is paid at the rate of 100 per day basic plus D.A. @ 120% of basic. He is allowed to take 30 minutes off during his hours shift for meals-break and a 10 minutes recess for rest. During a week, his card showed that his time was chargeable to:

Job X	15 hrs.
Job Y	12 hrs.
Job Z	13 hrs.

The time not booked was wasted while waiting for a job. In Cost Accounting, how would you allocate the wages of the workers for the week?

Solution Working Notes

- (i) Total effective hours in a week:
 $[(8 \text{ hrs.} - (30 \text{ mts.} + 10 \text{ mts.})) \times 6 \text{ days}] = 44 \text{ hours}$
- (ii) Total wages for a week:
 $(₹ 100 + 120\% \text{ of } ₹ 100) \times 6 \text{ days} = ₹ 1,320$
- (iii) Wage rate per hour: $= ₹ 30$
- (iv) Time wasted in waiting for job (Abnormal idle time):
 $= 44 \text{ hrs.} - (15 \text{ hrs.} + 12 \text{ hrs.} + 13 \text{ hrs.})$
 $= 4 \text{ hrs.}$

Allocation of wages in Cost Accounting

		₹
Allocated to Job X	: 15 hours $\times$ ₹ 30 =	450
Allocated to Job Y	: 12 hours $\times$ ₹ 30 =	360
Allocated to Job Z	: 13 hours $\times$ ₹ 30 =	
Charged to Costing Profit & Loss A/c	: 4 hours $\times$ ₹ 30 =	390
		120
Total		1,320

(E) Labour Turnover**Problem. 41**

The extracts from the payroll of Messrs Maheshwari Bros- is as follows:

Number of employees at the beginning of 1998	150
Number of employees at the end of 1998	200
Number of employees resigned	20
Number of employees discharged	5
Numbers of employees replaced due to resignations and discharges	20

Calculate the labour turnover rate for the factory by different methods.

Solution

(i) Separation method	$= \frac{\text{No. of Separations}}{\text{Av. No. of Workers}} \times 100 = \frac{20+5}{175} \times 100 = 14.3\%$
(ii) Replacement method	$= \frac{\text{No. of Replacements}}{\text{Av. No. of Workers}} \times 100 = \frac{20}{175} \times 100 = 11.4\%$
(iii) Flux Method	$= \frac{\text{No. of Separations} + \text{No. of Replacements}}{\text{Av. No. of Workers}} \times 100$ $= \frac{25 + 20}{175} \times 100 = 25.7\%$

Problem. 42

- (1) From the following data given by the personnel Department calculate the labour turnover rate applying:- (a) Separation method (b) Replacement Method (c) Flux Method

No. of workers on the payroll.

At the beginning of the month 900

At the end of the month 1,100

During the month 10 workers left, 40 persons were discharged and 150 workers were recruited. Of these, 25 workers are recruited in the vacancies of those leaving, while the rest were engaged for an expansion scheme.

Solution

(i) Separation method	$= \frac{50}{1,000} \times 100 = 5\%$
(ii) Replacement method	$= \frac{25}{1,000} \times 100 = 2.5\%$
(iii) Flux Method	(a) $\frac{\text{Separation} + \text{Re placement}}{\text{Average wor ker s}} \times 100$ $= \frac{50 + 25}{1,000} \times 100 = 7.5\%$ (b) $\frac{\text{Separation} + \text{Accession}}{\text{Average wor ker s}} \times 100$ $= \frac{50 + (25 + 125)}{1,000} \times 100 = 20\%$

Problem. 43

From the following information, calculate Labour turnover rate and Labour flux rate:

No. of workers as on 01.01.2000 = 7,600

No. of workers as on 31.12.2000 = 8,400

During the year, 80 workers left while 320 workers were discharged. 1,500 workers were recruited during the year of these, 300 workers were recruited because of exits and the rest were recruited in accordance with expansion plans. [May – 2001]

Solution

$$\begin{aligned} \text{Avg. no. of workers} &= \frac{\text{No. of wor ker s at the begining} + \text{No. of wor ker s at the end}}{2} \\ &= \frac{7,600 + 8,400}{2} = 8,000 \text{ workers} \end{aligned}$$

Labour Turnover rate

1. Separation method	$= \frac{\text{No. of separation}}{\text{Avg. no. of workers}} \times 100$ $= \frac{80 + 320}{8,000} \times 100 = 5\%$
2. Replacement method	$= \frac{\text{No. of workers replaced}}{\text{Avg. no. of workers}} \times 100$ $= \frac{300}{8,000} \times 100 = 3.75\%$

3. Flux method

$$= \frac{\text{No. of addition} + \text{No. of separation}}{\text{Avg. no. of workers}} \times 100$$

$$= \frac{1,500 + (80 + 320)}{8,000} \times 100 = 23.75\%$$

Problem. 44

The Cost Accountant of Tirupati Electronics Ltd. has computed rates for the quarter ending 31st march, 1998 as 10%, 5% and 3% respectively under 'Flux Method', 'Replacement Method', and 'Separation Method'. If the number of workers replaced during that quarter is 30, find out the number of (a) workers recruited and joined; and (b) workers left and discharged

Solution**Computation of Labour Turnover Rate**

$$1. \text{ Replacement Method} = \frac{\text{Number of Replacements}}{\text{Average Number of Workers}}$$

$$\text{or} \quad 0.05x = \frac{30}{x} = 0.05$$

$$X = \frac{30}{0.05} = 600$$

Hence, average number of workers = 600

$$2. \text{ Flux Method} = \frac{\text{No. of Separations} + \text{No. of accessions}}{\text{Average Number of workers}} =$$

$$\frac{18 + x}{600} = 0.10 \quad \text{or } 18 + x = 60$$

$$\text{or } x = 42$$

From the above, the information as desired by the question can be computed.

Problem. 45

Accountant of your company had computed labour turnover rates for the quarter ended 30th September, 2012 as 14%, 8% and 6% under Flux method. Replacement method and Separation method respectively. If the number of workers replaced during 2nd quarter of the financial year 2012-13 is 36, find the following:

- (a) The number of workers recruited and joined; and
 (b) The number of workers left and discharged.

[Nov. - 2012] 5 Marks

Solution

- (i) No. of workers recruited & joined = 36 workers (Accessions)
 (ii) No. of workers left & discharged = 27 workers (Separations)

Working Notes**(a) Calculation of average workers:-**

$$\text{Replacement method} = \frac{\text{No. of workers Replaced}}{\text{Average workers}} \times 100$$

$$18\% = \frac{36 \times 100}{\text{Average workers}}$$

$$\text{Average workers} = \frac{3,600}{8} = 450$$

$$(b) \quad \text{Separation Method} = \frac{\text{No. of workers left \& Discharged}}{\text{Average workers}} \times 100$$

$$6\% = \frac{\text{No. of Separation}}{450} \times 100$$

$$\text{No. of Separations} = 450 \times \frac{6}{100} = 27$$

$$(c) \quad \text{Flux Method} = \frac{\text{No. of Separations} + \text{No. of Accessions}}{\text{Average workers}} \times 100 = 14\%$$

$$= 27 + \text{Accessions} = 14\% \text{ of } 450 = 63$$

$$\text{Accessions} = 63 - 27 = 36$$

Problem. 46

The management of Moonshine Ltd. wants to have an idea of the profit lost/foregone as a result of labour turnover last year.

Last year sales accounted to ₹ 33,00,000 and the P/V ratio was 20%.

The total number of actual hours worked by the direct labour force was 2.40 lakhs. As a result of the delays by the Personnel Department in filling vacancies due to labour turnover, 25,000 potentially productive hours were lost. The actual direct labour hours included 40,000 hours attributable to training new recruits, out of which half of the hours were unproductive. The costs incurred consequent on labour turnover revealed on analysis the following.

	₹
Settlement cost due to leaving	25,000
Recruitment costs	20,000
Selection costs	12,000
Training costs	18,000

Assuming that the potential production lost due to labour turnover could have been sold at prevailing prices, ascertain the profit foregone/last year on account of labour turnover.

Solution

Statement of Labour turnover cost

Contribution foregone (See Working Notes 1 to 4)	75,000
Settlement Cost due to leaving	25,000
Recruitment Costs	20,000
Selection Costs	12,000
Training Costs	18,000
	1,50,000

Working Notes

1. **Actual hours worked** 2,40,000
 Less: 50% Unproductive training hours 20,000
 Actual productive hours 2,20,000
2. **Sales** ₹ 33,00,000
 Sales per productive hours = ₹ 33,00,000 / 2,20,000 = ₹ 15
3. **Potential productive hours lost** = 25,000
 Sales foregone = 25,000 hours × ₹ 15 = ₹ 3,75,000
4. **Contribution foregone** = Sales foregone × P/V Ratio
 = ₹ 3,75,000 × 20% = ₹ 75,000

Problem. 47

The management of Sunshine Ltd. wants to have an idea of the profit lost/foregone as a result of labour turnover last year.

Last year sales accounted to ₹ 66,00,000 and the P/V ratio was 20%.

The total number of actual hours worked by the direct labour force was 3.45 lakhs. As a result of the delays by the Personnel Department in filling vacancies due to labour turnover, 75,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training new recruits, out of which half of the hours were unproductive. The costs incurred consequent on labour turnover revealed on analysis the following.

	₹
Settlement cost due to leaving	27,420
Recruitment costs	18,725
Selection costs	12,750
Training costs	16,105

Assuming that the potential production lost due to labour turnover could have been sold at prevailing prices, ascertain the profit foregone/last year on account of labour turnover. [May – 1998]

Solution***Statement of Labour turnover cost***

Contribution foregone (See Working Notes 1 to 4)	3,00,000
Settlement Cost due to leaving	27,420
Recruitment Costs	18,725
Selection Costs	12,750
Training Costs	16,105
	<u>3,75,000</u>

Working Notes

1. **Actual hours worked** 3,45,000
 Less: 15,000 Unproductive training hours 15,000
 Actual productive hours 3,30,000
2. **Sales** Rs. 66,00,000
 Actual productive hours utilised 3,30,000 hours
 Sales per productive hours = ₹ 66,00,000 / 3,30,000 = ₹ 20
3. **Potential productive hours lost** = 75,000

Sales foregone = 75,000 hours × ₹ 20 = ₹ 15,00,000

4. **Contribution foregone** = Sales foregone × P/V Ratio
 = ₹ 15,00,000 × 20% = ₹ 3,00,000

Problem. 48

The management of Company are worried about their increasing labour turnover in the factory and before analyzing the causes and taking remedial steps, they want to have an idea of the profit foregone as a result of labour turnover in the last year.

Last year sales amounted to ₹ 83,03,300 and P/V ratio was 20 per cent. The total number of actual hours worked by the Direct labour force was 4.45 Lakhs. As a result of the delays by the personnel Department in filling vacancies due to labour turnover, 1,00,000 potentially productive hours were lost. The actual direct labour hours included 30,000 hours attributable to training on new recruits, out of which half of the hours were unproductive. The costs incurred consequent on labour turnover revealed, on analysis the following:

Settlement cost due to leaving	₹ 43,820	Recruitment Costs	₹ 26,740
Selecting costs	₹ 12,750	Training costs	₹ 30,490

Assuming that the potential production lost as a consequence of labour turnover could have been sold at prevailing prices, find the profit foregone last year on account of labour turnover. [Nov. – 2001]

Solution

Bina and Rina Ltd

Contribution foregone (See Working Notes 1 to 4)	3,86,200
Settlement Cost due to leaving	43,820
Recruitment Costs	26,740
Selection Costs	12,750
Training Costs	30,490
	5,00,000

Working Notes

- Actual hours worked** 4,45,000
 Less: 15,000 Unproductive training hours 15,000
 Actual productive hours 4,30,000
- Sales** ₹ 83,03,300
 Actual productive hours utilised 4,30,000 hours
 Sales per productive hours = ₹ 83,03,300 / 4,30,000 = ₹ 19.31
- Potential productive hours lost** = 1,00,000
 Sales foregone = 1,00,000 hours × ₹ 19.31 = ₹ 19,31,000
- Contribution foregone** = Sales foregone × P/V Ratio
 = ₹ 19,31,000 × 20% = ₹ 3,86,200.

Problem. 49

The rate of change of labour force in a company during the year ending 31st March, 2013 was calculated as 13%, 8% and 5% respectively under 'Flux Method', 'Replacement method' and 'Separation method'. The number of workers separated during the year is 40.

You are required to calculate:

- (i) Average number of workers on roll.
- (ii) Number of workers replaced during the year.
- (iii) Number-of new accessions i.e. new recruitment.
- (iv) Number of workers at the beginning of the year.

[Nov. – 2013] 8 Marks

Solution

(i) Average number of workers on roll	$\text{Separation Method} = \frac{\text{No. of workers separated}}{\text{Average No. of workers on roll}}$ $\frac{5}{100} = \frac{40}{\text{Average No. of workers on roll}}$ $\text{Average No. of workers} = 800$
(ii) No. of workers replaced during the year	$\text{Replacement method} = \frac{\text{No. of replacement}}{\text{Average No. of workers on roll}}$ $\frac{8}{100} = \frac{\text{No. of replacement}}{800}$ $\text{No. of replacement} = 64$
(iii) No. of new accessions	$\text{Flex method} = \frac{\text{No. of separation} + \text{No. (Replacement + New Accession)}}{\text{Average No. of workers}}$ $\text{Or } 0.13 = \frac{40 + 64 + \text{New Accessions}}{800}$ $\text{Or } (800 \times 0.13) - (40 + 64) = \text{New Accessions}$ $\text{Or New Accessions} = \text{NIL}$
(iv) Average No. of worker	$= \frac{\text{Opening} + \text{Closing}}{2}$ $\text{Or } 800 = \frac{0 + (2 - 40 + 64)}{2}$

Topper's Institute	Labour 2. 45
	Or $800 \times 2 = '0' + '0' + 24$ Or $1,600 - 24 = 2 '0'$ Or $0 = \frac{1,576}{2} = 788$ Or Opening worker's = 788

Problem.50

Human Resources Department of A ltd computed Labour Turnover by Replacement Method at 3% for the quarter ended June 2015. During The quarter, fresh recruitment of 40 workers was made. The number of workers at the beginning and end of the quarter was 990 and 1010 respectively.

You are required to calculate the labour Turnover Rate by Separation Method and Flux Method.

[Nov. - 2015 5 Marks]

Solution

- (a) $L = \text{Average Labour Force} = \frac{990 + 1,010}{2} = 1,000$
- (b) Labour Turnover by Replacement Method = 3% (Given). So, $\frac{R}{L} = \frac{R}{1,000} = 3\%$. So, $R = 30$.
- (c) $A (\text{Accessions}) = \text{Replacements} + \text{New Recruitments} = R + N = 30 + 40 = 70$
- (d) Also, $A = \text{No. of Workers at the end of the Period} + \text{No. of Separations} (-) \text{No of Workers at the Beginning of the Period}$
From the above equation, $70 = 1,010 + S (-) 990$. So, $S = 50$
- (e) Labour Turnover Rates are computed as under-
- (I) Separation Method: $\frac{S}{L} = \frac{50}{1,000} = 5\%$
- (II) Flux Method: $\frac{S + R + N}{L} = \frac{50 + 30 + 40}{1,000} = 12\%$

Problem.51

A company is undecided as to what kind of wage scheme should be introduced. The following particulars have been compiled in respect of three systems, which are under consideration of the management.

	Workers		
	A	B	C
Actual hours worked in a week	38	40	34
Hourly rate of wages	₹ 6	₹ 5	₹ 7.20

Topper's Institute		Labour 2. 46	
Production in units			
Product – P	21	-	60
Product – Q	36	-	135
Product – R	46	25	-
Standard time allowed per unit of each product is:			
	P	Q	R
Minutes	12	18	30

For the purpose of piece rate, each minute is valued at ₹ 0.10. You are required to calculate the wages of each worker under:

- Guaranteed hourly rates basis
- Piece work earnings basis, but guaranteed at 75% of basic pay (guaranteed hourly rate) if his earnings are less than 50% of basic pay.
- Premium bonus basis where the worker receives bonus based on Rowan scheme.

[P.M.]

Solution

- Computation of wages of each worker under guaranteed hourly rate basis

Workers	Actual hours worked in a week	Hourly rate of wages (₹)	Wages (₹)
(a)	(b)	(c)	(d) = (b) × (c)
A	38	6.00	228.00
B	40	5.00	200.00
C	34	7.20	244.80

- Computation of wages of each worker under piece work earning basis

		Worker A		Worker B		Worker C	
Product	Rate per Unit	Units	Wages (₹)	Units	Wages (₹)	Units	Wages (₹)
(a)	(b)	(c)	(d=b*c)	(e)	(f=b*e)	(g)	(h=b*g)
P	1.20	21	25.20	-	-	60	72
Q	1.80	36	64.80	-	-	135	243
R	3.00	46	138.00	25	75	-	-
			228.00		75.00		315.00

Since each worker has been guaranteed at 75% of basic pay, if his earnings are less than 50% of basic pay (guaranteed hourly rate), therefore, earning of the workers will be as follows Workers A and C will be paid the wages as computed viz. ₹ 228 and ₹ 315 respectively. The computed earnings under piece rate basis for worker B is ₹ 75 which is less than 50% of basic pay i.e., ₹ 100 (200 × 50%) therefore he would be paid ₹ 150 i.e. 75% × ₹ 200

Working Notes:**1. Piece rate/ per unit**

Product	Standard time per unit in minutes	Piece rate each minute (Rs.)	Piece rate per unit (Rs.)
(a)	(b)	(c)	(d) = (b) × (c)
P	12	0.10	1.20
Q	18	0.10	1.80
R	30	0.10	3.00

2. Time allowed to each worker

Worker A = (21 units × 12 minutes) + (36 units × 18 minutes) + (46 units × 30 minutes)
= 2,280 minutes or 38 hours

Worker B = 25 units × 30 minutes
= 750 minutes or 12.5 hours

Worker C = (60 units × 12 minutes) + (135 units × 18 minutes)
= 3,150 minutes or 52.5 hours

(iii) Computation of wages of each worker under Premium bonus basis (where each worker receives bonus based on Rowan Scheme)

Workers	Time allowed hours	Time taken Hours	Time saved hours	Wage rate/hour (₹)	Earning (₹)	Bonus (₹)	Total of earning & bonus (₹)
A	38.00	38.00	-	6.00	228.00	-	228.00
B	12.50	40.00	-	5.00	200.00	-	200.00
C	52.50	34.00	18.50	7.20	244.80	86.26*	331.06

$$\begin{aligned}
 \text{* Bonus under Rowan Scheme} &= \frac{\text{Time Saved}}{\text{Time Allowed}} \times \text{Time taken} \times \text{Rate per hour} \\
 &= \frac{18.5 \text{ hours}}{52.5 \text{ hours}} \times 34 \text{ hours} \times 7.20 \\
 &= ₹ 86.26
 \end{aligned}$$

Problem.52

Standard Time for a job is 90 hours. The hourly rate of guaranteed wages is ₹ 50. Because of the saving in time a worker A gets an effective hourly rate of wages of ₹ 60 under Rowan premium bonus system. For the same saving in time, calculate the hourly rate of wages a worker B will get under Halsey premium bonus system assuring 40% to worker.

Solution

Halsey

$$\text{Total wages} = (\text{AH} \times \text{HR}) + 40\% (\text{TS} \times \text{R/H})$$

$$TW - (AH \times R/H) + 40\% (TS \times R/H)$$

$$= (72 \times 50) + 40\% (18 \times 50) = 3,960$$

$$= \frac{3960}{72} = ₹ 55$$

$$\text{Effective rate/Hour} = \frac{\text{Total wages}}{\text{Actual hour}}$$

Working Note:

$$\text{Effective rate/Hour} = \frac{TW}{AH}$$

Let suppose Actual hour = x

$$\text{Or,} \quad 60x = (AH \times R/H) + \frac{TS}{SH} (AH \times R/H)$$

$$\text{Or} \quad 60x = (x \times 50) + \frac{90 - x}{90} (x \times 50)$$

$$\text{Or} \quad 60x - 50x = \frac{450x - 5x^2}{9}$$

$$\text{Or} \quad 9(10x) = 450x - 5x^2$$

$$\text{Or} \quad 5x^2 = 450x - 90x$$

$$\text{Or} \quad 5x \times x = 360x$$

$$\therefore x = \frac{360}{5} = 72$$

$$\therefore AH = 72H$$

Problem.53

A, B and C are three industrial workers working in Sports industry and are experts in making cricket pads. A, B and C are working in Mahi Sports, Virat Sports and Sikhar Sports companies respectively. Workers are paid under different incentive schemes. Company wise incentive schemes are as follows:

Company	Incentive Scheme
Mahi Sports	Emerson's efficiency system
Virat Sports	Merrick Differential piece rate system
Sikhar Sports	Taylor's Differential piece work system

The relevant information for the industry is as under:

Standard working hours	8 hours a day
Standard output per hour (in units)	2
Daily wages rate	Rs.360
No. of working days in a week	6 days

Actual outputs for the week are as follows:

A	B	C
132 Units	108 Units	96 Units

You are required to calculate effective wages rate and weekly earning of all the three workers:

Solution

Calculation of effective wages rate and weekly earnings of the workers A, B and C

Workers	A	B	C
Standard Output	96 Units (8 hrs. × 2 units × 6 days)	96 Units (8 hrs. × 2 units × 6 days)	96 Units (8 hrs. × 2 units × 6 days)
Actual Output	132 Units	108 Units	96 Units
Efficiency (%)	$\frac{132\text{units}}{96\text{units}} \times 100 = 137.5$	$\frac{108\text{units}}{96\text{units}} \times 100 = 112.5$	$\frac{96\text{units}}{96\text{units}} \times 100 = 100$
Daily wages Rate	Rs.360	Rs.360	Rs.360
Incentive System	Emerson's Efficiency System	Merrick Differential Piece rate system	Taylor's Differential piece work system
Rate of Bonus	57.5% of time rate (20% + 37.5%)	20% of ordinary piece rate	25% of ordinary piece rate
Effective Wage Rate	Rs.70.875 per hour $\left(\frac{360}{8\text{hours}} \times 157.5\% \right)$	Rs.27 per piece $\left(\frac{360}{16\text{units}} \times 120\% \right)$	Rs.28.125 per piece $\left(\frac{360}{16\text{units}} \times 125\% \right)$
Total weekly earnings	Rs.3,402 (8 hrs. × 6 days × Rs.70.875)	Rs.2,916 (108 units × Rs.27)	Rs.2,700 (96 Units × Rs.28.125)

Problem.54

Calculate the earnings of A and B from the following particulars for a month and allocated the labour cost to each job X, Y and Z:

	A	B
(i) Basic Wages	₹ 100	₹160
(ii) Dearness Allowance	50%	50%
(iii) Contribution to provident Fund (on basic wages)	8%	8%
(iv) Contribution to Employees' State Insurance (on basic wages)	2%	2%
(v) Overtime	10 hours	

The normal working hours for the month are 200. Overtime is paid at double the total of normal wages and dearness allowance. Employer's contribution to state Insurance and Provident Fund are at equal rate with employees' contributions. The two workers were employed on jobs X, Y and Z in the following proportions:

Topper's Institute		Labour 2. 50		
	Jobs			
	X	Y	Z	
Worker A	40%	30%	30%	
Worker B	50%	20%	30%	

Overtime was done on job Y.

[S.M. Page No.3.16, Illustration.2]

Solution

Statement showing earnings of Workers A and B

Workers	A (₹)	B (₹)
Basic Wages	100.00	160.00
Dearness Allowance (50% of Basic Wages)	50.00	80.00
Overtime Wages (Refer to Working Note 1)	15.00	-
Gross Wages earned	165.00	240.00
Less: Provident Fund (8% × ₹ 100); (8% × ₹ 160)	(8.00)	(12.80)
- ESI (2% × ₹ 100); (2% × ₹ 160)	(2.00)	(3.20)
Net Wages paid	155.00	224.00

Statement of Labour Cost

	A (₹)	B (₹)
Gross Wages (excluding overtime)	150.00	240.00
Employer's contribution to P.F. and E.S.I	10.00	16.00
	160.00	256.00
Ordinary wages Labour Rate per hour (₹ 160 ÷ 200 hours); (₹ 256 ÷ 200 hours)	0.80	1.28

Statement Showing Allocation of Wages to Jobs

	Total Wages	Jobs		
		X	Y	Z
Worker A				
Ordinary Wages (4:3:3)	160.00	64.00	48.00	48.00
Overtime	15.00	-	15.00	-
Worker B				
Ordinary Wages (5:2:3)	256.00	128.00	51.20	76.80
	431.00	192.00	114.20	124.80

Working Notes:

- Normal Wages are considered as basic wages

$$\begin{aligned}
 \text{Over time} &= \frac{2 \times (\text{Basic Wage} + D.A.) \times 10 \text{ hours}}{200 \text{ hours}} \\
 &= 2 \times \frac{150}{200} \times 10 \text{ hours} \\
 &= 1.50 \times 10 \text{ hours} \\
 &= ₹ 15
 \end{aligned}$$

Problem.55

Calculate the earnings of worker from the following information under Bedeaux system.

Standard time for a product A-30 seconds plus relaxation allowance of 50%.

Standard time for a product B- 20 seconds plus relaxation allowance of 50%

During 8 hour day for

Actual output of product A	500 units
Actual output of product B	300 units
Wage rate	₹ 10 per hour

[S.M. Page No. 3.44, Illustration.13]

Solution

Bedeaux point per unit of product A:

$$30 \text{ seconds} + 15 \text{ seconds} / 60 = 45/60 = 0.75 \text{ B's}$$

Bedeaux point per unit of product B:

$$20 \text{ seconds} + 10 \text{ seconds} / 60 = 30/60 = 0.50 \text{ B's}$$

Total Production in terms of B's :

$$500 \times 0.75 + 300 \times 0.50 = 525 \text{ B's}$$

Standard B's (8 hours $\times$ 60)=480 B's

No. of B's saved (525 B's – 480 B's) = 45 B's

Earnings = hours worked $\times$ rate per hour + $75/100 \times 45/60 \times ₹10$

$$= 8 \text{ hours} \times ₹ 10 + 75/100 \times 45/60 \times ₹10$$

$$= ₹ 80 + ₹ 5.63 = ₹ 85.63$$

Problem.56

Both direct and Indirect labours of a department in a factory are entitled to production bonus in accordance with a group incentive scheme, the outline of which is as follows:

- For any production in excess of the standard rate fixed at 16,800 tonnes per month (of 28 days) a general incentive of ₹ 15 per tonne is paid in aggregate. The total amount payable to each separate group is determined on the basis of an assumed percentage of such excess production being contributed by it, namely @ 65% by direct labour, @ 15% by inspection staff, @ 12% by maintenance staff and @ 8% by supervisory staff.
- Moreover, if the excess production is more than 20% above the standard, direct labour also get a special bonus @ ₹ 5 per tonne for all production in excess of 120% of standard.
- Inspection staff are penalized @ ₹ 20 per tonne for rejection by customer in excess of 2% of production.
- Maintenance staff are also penalized @ ₹ 20 per hour for breakdown.

From the following particulars for a month, work out production bonus earned by each group:

- Actual working days : 25
- Production : 21,000 tonnes
- Rejection by customer: 500 tonnes
- Machine breakdown : 40 hours

Solution

$$1. \quad \text{Standard output per day} = \text{Standard output per month} / \text{Budgeted number of days in a month} \\ = 16,800 \text{ tonnes} / 28 \text{ days} = 600 \text{ tonnes}$$

$$2. \quad \text{Standard output for 25 days} = 600 \text{ tonnes} \times 25 \text{ days} = 15,000 \text{ tonnes}$$

(a) General Incentive

(i)	Standard output	:	15,000 tonnes
(ii)	Actual output	:	21,000 tonnes
(iii)	Excess output over Standard	:	21,000 – 15,000 = 6,000 tonnes
(iv)	percentage of excess	:	40%
	production to standard output:		6,000 tonnes / 15,000 tonnes $\times$ 100
(v)	Aggregate of general incentive:		= excess output $\times$ ₹ 15
			= 6,000 tonnes $\times$ ₹ 15
			= ₹ 90,000
(vi)	Allocation of general incentive		
	Direct labour	:	65% of ₹ 90,000 = ₹ 58,500
	Inspection staff	:	15% of ₹ 90,000 = ₹ 13,500
	Maintenance staff	:	12% of ₹ 90,000 = ₹ 10,800
	Supervisory staff	:	8% of ₹ 90,000 = ₹ 7,200
	Total	:	<u>90,000</u>

(b) Special bonus to direct workers

- (i) 20% is the excess output over 120% of standard output
or 3,000 tonnes (15,000 tonnes $\times$ 20%)
- (ii) Special incentive = 3,000 tonnes $\times$ ₹ 5 = ₹ 15,000

(c) Penalty imposed on inspection staff

- (i) Normal rejection = 2% of production = 2 % of 21,000 tonnes = 420 tonnes
- (ii) Actual rejection = 500 tonnes
- (iii) Excess rejection over normal rejection = 500 – 420 = 80 tonnes
- (iv) Penalty = 80 tonnes $\times$ ₹ 20 per tonne = ₹ 1,600

(d) Penalty imposed on maintenance staff

- (i) Breakdown hours = 40 hours
- (ii) Penalty = 40 hours $\times$ ₹ 20 per hour = ₹ 800

Statement of production bonus earned by each group

Particulars	Direct labour ₹	Inspection staff ₹	Maintenance staff ₹	Supervisory staff ₹	Total ₹
Aggregate					
General incentive	58,500	13,500	10,800	7,200	90,000
Special bonus	15,000	-	-	-	15,000
Penalty	-	(1,600)	(800)	-	(2,400)
Production bonus	73,500	11,900	10,000	7,200	1,02,600

Problem.57

A worker is paid ₹ 1,000 per month and a dearness allowance of ₹ 200 p.m. Worker contribution to provided fund is @ 10% and employer also contributes the same amount as the employee. The employees State Insurance Corporation premium is 6.5% of wages of which 1.75% is paid by the employees. It is the firm's practice to pay 2 month's wages as bonus each year.

The number of working days in a year are 300 of 8 hours each. Out of these the worker is entitled to 15 days leave on full pay. Calculate the wage rate per hour for costing purposes.

[S.M. Page No.3.71, Illustration.26]

Solution

Wages paid to worker during the year $(1,000 + 200) \times 12$ 14,400

Add: Employer Contribution to :

Provident Fund@ 10% 1,440

E.S.I Premium 4.75% (6.5 – 1.75) 684

Bonus at 2 month's wages (Basic + DA) 2,400

Total 18,924

Effective hours per year : $285 \times 8 = 2,280$

Wage rate per hour (for costing purpose) : ₹ 18,924 / 2,280 = ₹ 8.30

Problem.58

RST Company Ltd. has computed labour turnover rates for the quarter ended 31st March, 2017 as 20%, 10% and 5% under flux method, replacement method and separation method respectively. If the number of workers replaced during that quarter is 50, find out (i) Workers recruited and joined(ii) Workers left and discharged and (iii) Average number of workers on roll.

[May – 2017, 5 Marks]

Solution

Average no. of workers on roll during the year

1. Labour turnover rate under replacement method

$$= \frac{\text{No. of replacements}}{\text{Average number of worker on roll}} \times 100$$

$$10\% = \frac{50}{\text{Average number of worker on roll}} \times 100$$

$$\text{Average No. of workers on roll} = 500$$

2. Number of workers left and discharged

Labour turnover rate under separation method (5%)

$$= \frac{\text{No. of separations}}{\text{Average number of workers on roll (500)}} \times 100$$

No. of separation = 25

3. No. of workers recruited and joined

Labour turnover rate under flux method (20%)

$$= \frac{s(25) + \text{Accession}}{\text{Average number of workers on roll (500)}} \times 100$$

No. of accessions = 75