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MATERIAL

Problem 1.

Two components A and B are used as follows:

Normal usage	60 per week each
Minimum usage	30 per week each
Maximum usage	90 per week each
Re-order quantity	A: 500 ; B: 800
Re-order period	A: 3 to 5 weeks ; B: 2 to 4 weeks

Calculate for each component : (a) Re-order level ; (b) Minimum level ; (c) Maximum level ; and (d) Average stock level.
Comment briefly on the difference in the levels for the two components.

Sol- (a) Re-order level : A – 450 units, B – 360 units ; (b) Minimum level : A – 210 units, B – 180 units ; (c) Maximum level : A – 860units, B- 1,100 units ; (d) Average stock level : A – 535 units, B – 640 units.

Problem 2.

Shown below are the consumption figures forecast for BR Limited in respect of material 562.

Material 562	
Month	**Consumption (units)**
January	2000
February	2000
March	2800
April	2800
May	3000
June	3000

Re-order Quantity : 8,000 units	
Month	**Consumption (units)**
July	3000
August	3000
September	2200
October	2200
November	2000
December	2000

Delivery period from suppliers : Minimum 2 months
Maximum 4 months
You are required to calculate the estimated average stock level for the year.

Sol- Re-order level = 12,000 units, Max level = 16,000 units, Min level = 4,500 units, Avg stock level = 10,250 units.

Problem 3.

In manufacturing its products, a company uses three raw materials, A, B and C in respect of which the following particulars are available :

Raw material	*Usage per unit of product kg.*	*Re-order quantity kg.*	*Price per kg.*	*Delivery period in weeks*			*Re-order level kg.*	*Minimum level kg.*
				Min.	Avg.	Max.		
A	10	10,000	10	1	2	3	8,000	
B	4	5,000	30	3	4	5	4,750	
C	6	10,000	15	2	3	4		2,000

Weekly production varies from 175 to 225 units, average being 200 units.
What would you expect the quantities of the following to be ?
(i) Minimum stock of A ; (ii) Maximum stock of B ; (iii) Re-order level of C ; (iv) Average stock level of A.

Sol- (i) Min stock of A = 4,000 kg, (ii) Max stock of B = 7,650 kg, (iii) Re-order level of C = 5,400 kg, (iv) Avg Stock level of A = 10,125 kg.

Problem 4.

The following information is available in respect of a particular material:

Maximum consumption	12,000 units per week
Minimum consumption	4,000 units per week
Normal consumption	8,000 units per week
Re-order quantity	48,000 units per week
Time required for delivery	Minimum 4 weeks
	Maximum 6 weeks
Time sufficient for emergency supply	2 weeks

You are required to calculate : (a) Re-order level ; (b) Minimum level ; (c) Maximum level ; (d) Danger level ; and (e) Average stock level.

Sol- (a) Re-order level = 72,000 units, (b) Min level = 32,000 units, (c) Max level = 1,04,000 units, (d) Danger level = 16,000 units, (e) Avg stock level = 56,000 units.

Problem 5.

From the following information calculate re-order level, maximum level and minimum level of stock :

Re-order quantity	6,000 units
Minimum stock level to allow for emergencies	5 weeks
Average lead time	4 weeks
Average consumption rate per week	500 units
Minimum consumption in 4 weeks	1,600 units

Sol- Re-order level = 4,500 units, Max level = 8,900 units, Min level = 2,500 units.

Problem 6.

From the following calculate economic order quantity and the number of orders to be placed per quarter:

Quarterly consumption	2000 kg.
Cost of placing one order	₹ 50
Cost per unit	₹ 40
Storage cost	80% on average inventory

Sol- EOQ = 500kg, No. of orders per quarter = 4.

Problem 7.

A manufacturing company produces a special product 'Sorbina' the monthly demand for which is 500 units. The following particulars are available in respect of the material used for manufacturing the product :

Cost of placing an order	₹ 120
Annual carrying cost per unit	₹ 12
Normal usage	60 units per week
Minimum usage	30 units per week
Maximum usage	90 units per week
Delivery period	4 to 6 weeks

Compute from the above : (a) Re-order quantity ; (b) Re-order level ; (c) Minimum level ; (d) Maximum level ; (e) Average stock level.

Sol- (a) Re-order quantity = 250 units (approx), (b) Re=-order level = 540 units, (c) Min level = 240 units, (d) Max level = 670 units, (e) Avg stock level = 455 units.

Problem 8.

SGN Ltd. provides the following information in respect of material 'X' :

Supply period	5 to 15 days
Rate of consumption :	
Average	15 units per day
Maximum	20 units per day
Yearly	5,000 units
Ordering costs	₹20 per order
Purchase price per unit	₹ 50
Storage costs	10% of unit value.

Compute : (i) Re-order level ; (ii) Minimum level, (iii) Maximum level.

Sol- (i) Re-order level = 300 units, (ii) Min level = 150 units, (iii) Max level = 450 units.

Problem 9.

Re-order quantity of material *X* is 5,000 kg. ; maximum level 8,000 kg. ; minimum usage 50 kg. per hour ; minimum re-order period 4 days ; daily working hours in the factory is 8 hours. You are required to calculate the re-order level of material *X.*

Sol- Re-order level = 4,600 kg.

Problem 10.

If the minimum stock level and average stock level of raw material *A* are 4,000 and 9,000 units respectively, find out its 're-order quantity'.

Sol- Re-order quantity = 10,000 units.

Problem 11.

From the details given below, calculate : (i) Re-order level ; (ii) Maximum level ; (iii) Minimum level ; (iv) Danger level.
Re-ordering quantity is to be calculated on the basis of following information :
Cost of placing a purchase order is ₹ 20.
Number of units to be purchased during the year is 5,000.
Purchase price per unit inclusive of transportation cost is ₹ 50.
Annual cost of storage per unit is ₹ 5.
Details of lead time : Average 10 days, Maximum 15 days, Minimum 6 days. For emergency purchases 4 days.
Rate of consumption : Average 15 units per day, Maximum 20 units per day.

Sol- (i) Re-order level = 300 units, (ii) Max level = 440 units, (iii) Min level = 150 units,

(iv) Danger level = 60 units.

Problem 12.

From the following information calculate : (i) Economic order quantity ; (ii) Total annual carrying and ordering cost at that quantity ; (iii) Re-order level ; (iv) Minimum level ; (v) Maximum level ; (vi) Average stock level ; (vii) Danger level.
Rate of usage : 5 kg. per unit of finished product
Weekly production of finished product varies from 50 units to 150 units
Purchase price of input unit : ₹ 20
Annual carrying cost : 6.5%
Ordering cost per order : ₹ 100
Lead time : 3 weeks to 7 weeks ; for emergency purchases 2 weeks.

Sol- (i) Economic order quantity = 2,000 kg.

Problem 13.

A manufacturer buys certain equipment from outside suppliers @ ₹ 30 per unit. Annual needs are 800 units. The following further data are available :

Annual return on investment	:	10%
Rent, insurance, taxes, etc., per unit per annum	:	₹ 1
Cost of placing an order	:	₹ 100

Determine the economic order quantity.

Sol- EOQ = 200 units.

Problem 14.

From the following particulars relating to inventory find out : (a) How much should be ordered each time ? (b) When should the order be placed ? (c) What should be the ideal inventory level immediately before the delivery of material ordered is received ? (d) How many times orders for *EOQ* should be placed in a year ?

Annual consumption	12,000 units (in 360 days)
Cost per unit	₹ 1
Ordering cost	₹ 12 per order
Inventory carrying charge	20%
Normal lead time	15 days
Safety stock	30 days consumption

Sol- (a) EOQ = 1,200 units, (b) Re-order level = 1,500 units, (c) Ideal inventory level = 1,000 units, (d) No. of orders for EOQ = 10 times.

Problem 15.

A company uses 2,500 units of a material per month. Cost of placing an order is ₹ 150. The cost per unit is ₹ 20. The re-order period is 4 to 8 weeks. The minimum consumption of raw materials is 100 units whereas the average consumption is 275 units. The carrying cost of inventory is 20% p.a.

Calculate : (i) Re-order quantity ; and (ii) Re-order level.

Sol- (i) Re-order quantity = 1,500 units, (ii) Re-order level = 3,600 units.

Problem 16.

From the following information, calculate re-order quantity :

Maximum re-order period	8 weeks
Average stock	600 units
Average usage	50 units per week
Maximum usage	80 units per week
Average re-order period	6 weeks

Sol. Re-order quantity = 300 units.

Problem 17.

KT Ltd. provides you the following information :

Re-order level	64,000 units
Re-order quantity	40,000 units
Minimum stock level	34,000 units
Maximum stock level	94,000 units
Average lead time in the past	2.5 days
The difference between maximum and minimum lead time	3 days

Determine the maximum and minimum usage rates and leads times.

Sol- Min lead time = 1 day, Max lead time = 4 days, Min usage = 10,000 units, Max lead time = 16,000 units.

Problem 18.

Suman Ltd. buys in lots of 500 boxes which is a 3 month supply. The cost per box is ₹ 125 and the ordering cost is ₹ 150 per order. The inventory carrying cost is estimated at 20% of unit value per annum.

(i) What is the total annual cost of the existing inventory policy ?
(ii) How much money would be saved by employing the economic order quantity ?

Sol- (i) Total annual cost = 6,850, (ii) Saving in annual cost = ₹ 2,962.50.

Problem 19.

The annual requirement of an item is 12,000 units, each costing ₹ 6. Every order costs ₹ 200 at release and inventory carrying charges are 20% of the average inventory per annum.
Find out : (i) Economic order quantity and corresponding total inventory cost (including item costs) ; (ii) Whether the item should be purchased in lots of 6,000 units at a time, if the price per unit is reduced by 5% for this quantity.

Sol- (i)EOQ = 2,000 units and Total inventory cost = 74,400, (ii) Total inventory cost = 72,220

Problem 20.

(a) The purchase department of your company has received an offer of quantity discounts on its orders of materials as under :

Price per ton	*Tons ordered*
₹	
1,200	less than 500
1,180	500 and less than 1,000
1,160	1,000 and less than 2,000
1,140	2,000 and less than 3,000
1,120	3,000 and above

The annual requirement for the material is 5,000 tons. The ordering cost per order is ₹ 1,200 and the stock holding cost is estimated at 20% of material cost per annum.
You are required to compute the most economical purchase level.

(b) What will be your answer to the above question, if there are no discount offered and the price per ton is ₹ 1,500.

Sol- (a) Order size (tons) = 400 – (60,63,600), 500 – (59,71,000), 1,000 – (59,22,000), 2,000 – (59,31,600), 3,000 – (59,38,400).
(b) EOQ = 200 tons.

Problem 21.

Draw up a priced stores ledger card from the following particulars, using LIFO method of valuation of issues :

2019					
July	1	Opening balance	500	pcs.	@ ₹ 2.00
	3	Issue	70	"	
	4	Issue	10	"	
	7	Receipt (from suppliers)	200	"	
	9	Return (from department) from issue dated o3.7.19	20	"	@ ₹ 2.10
	10	Shortage found	10	"	
	13	Issue	70	"	
	14	Receipt (from suppliers)	100	"	@ ₹ 2.20
	18	Issue	300	"	
	26	Receipt (from suppliers)	50	"	@ ₹ 2.00
	30	Issue	60	"	

Sol- Amt = 700

Problem 22.

The Particulars of receipt and issues of a material in a factory in August, 2019 are as under :

Aug.	1	Opening balance	1,500 kg.	@ 12.00 per kg.
	2	Issued	100 kg.	
	3	Issued	250 kg.	
	4	Issued	300 kg.	
	5	Received (purchase)	400 kg.	@ 12.50 per kg.
	9	Issued	300 kg.	
	10	Received (purchase)	200 kg.	@ 12.50 kg.
	11	Issued	300 kg.	
	12	Returned from workshop out of issues on 3rd August	20 kg	
	13	Issued	450 kg.	
	16	Received (purchase)	500 kg.	@ 13.00 per kg.
	18	Issued	400 kg.	
	20	Returned from workshop out of issues on 9th August	60 kg.	
	22	Issued	300 kg.	
	26	Received (purchase)	400 kg.	@ 12.00 per kg.
	29	Issued	200 kg.	

Pricing of issues is to be done on FIFO basis. A shortage of 10 kg. was noticed on 16th August. Prepare the stores ledger account for the month of August, 2019 in respect of the material.

Sol- Amt = 5,710

Problem 23.

BX Ltd. furnishes the following transaction in stores for April, 2019 :

2019	1	Opening balance	25	units	value ₹ 162.50
April	4	Issues, Requisition No. 76	8	"	
	6	Receipts from P & Co. GRN No. 18	50	"	@ ₹ 5.75 per unit
	7	Issues, Requisition No. 82	12	"	
	10	Returns to P & Co.	10	"	
	12	Issues, Requisition No. 95	15	"	
	13	Issues, Requisition No. 102	20	"	
	15	Receipts from Q & Co. GRN No. 26	25	"	@ ₹ 6.10 per unit
	17	Issues, Requisition No. 108	10	"	
	19	Received replacement from P & Co.			
		against return dated 10.4.19, GRN No. 30	10	"	
	20	Returned from department, material			
		out of issues on 17th, MRN No. 5	5	"	
	22	Transfer from Job 156 to Job 159			
		in the Department MTN 7	5	"	
	26	Issues, Requisition No. 120	10	"	
	29	Transfer from Department *A* to Department *B*	5	"	
	30	Shortage in stock-taking	2	"	

Write up the priced stores ledger applying FIFO method.

Sol- Amt = 167.30

Problem 24.

From the following details write stores ledger under simple average method :

2019				
Dec.	1	Opening balance	100 kg.	@ ₹ 5.00
	5	Received	50 kg.	@ ₹ 5.20
	8	Issued	120 kg.	
	10	Issued	10 kg.	
	15	Received	80 kg.	@ ₹ 5.40
	18	Issued	50 kg.	
	20	Received	100 kg.	@ ₹ 5.60
	25	Issued	40 kg.	
	28	Issued	60 kg.	

The stock verifier found a shortage of 10 kg. on 16.12.19 and another shortage of 10 kg. on 26.12.19.

Sol- Amt = 158

Problem 25.

The following are the receipts and issues of stores Material Y in a manufacturing concern :

2019		
Dec.	1	Opening stock 100 units at ₹ 10 per unit.
	2	Issued 25 units to Department *A*
	7	Received 425 units at ₹ 11 per unit.
	10	Issued 200 units to Department *B*.
	12	Returned to stores 10 units from Department *A*.
	15	Returned to vendor 20 units out of the quantity received on 7th.
	17	Received 110 units at ₹ 12.50 per unit.
	25	Received 200 units at ₹ 10 per unit.
	29	Issued 200 units to Department B.
	30	Received 100 units at ₹ 11 per unit.

Enter the above transactions in the stores ledger account of Material *Y*, using the average cost (weighted) method. (Average cost to be calculated correct to two decimal places of a rupee.)

Sol- Amt = 4,406

LABOUR

Problem 1.

A time study was conducted for a worker in a factory. The observation are as under :

Observed time	40 hours week
Output	120 units
Time for which worker could not work	20%
Performance rating	125%

It was also thought appropriate to make the following allowances :

Fatigue	10%
Personal needs	7%
Unavoidable work delay	3%

You are required to determine : (a) Productive time ; (b) Normal time ; (c) Standard time if above allowances are applied to standard time.

Problem 2.

In a factory, workers are paid on a differential piece work system, the differentials applied are 80% piece rate below standard and 120% piece rate at or above standard.
From the following particulars calculate daily earnings of the workers *A,B* and *C :*
Standard production : 10 units per hour.
Time rate : ₹ 1.00 per hour.
Production in a day of 9 hours : *A* 75 units ; *B* 90 units ; *C* 110 units.

Problem 3.

From the following particulars, calculate earnings under differential piece rate system, where basic piece rate is guaranteed below standard and the workers get 110% of basic piece rate between 100% and 120% efficiency and 120% of basic piece rate above 120% efficiency.
Standard production : 800 units per week of 48 hours. Basic piece rate : ₹ 0.10 per unit.
Production for the week : *A* 720 units ; *B* 800 units ; *C* 880 units ; *D* 1,000 units.

Problem 4.

Calculate the earnings of workers *A, B* and *C* under Straight Piece Rate system and Merrick's 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 "
Worker *c*	600 "

Problem 5.

An organisation operates an individual premium bonus scheme in which an operative's performance is calculated and paid for as follows :
Each task is given a target expressed in standard minutes. The quantity of weekly output achieved is stated in terms of total of standard minutes. The week's total of standard minutes is expressed as a percentage of attendance time (to the nearest whole number). The operator is paid :

Percentage performance	Rate paid per hour
0 - 75	₹ 2.20
76 - 90	₹ 2.40
91 - 110	₹ 2.80
111 and over	₹ 3.40

Three products are assembled and have the following standard times :

Product *A*	42	Standard	minutes
Product *B*	60	"	"
Product *C*	75	"	"

Calculate the gross pay for each operator from the following information :

Operator	*Hours attended*	*Performance products assembled*		
		A	*B*	*C*
P	38	15	13	11
Q	39	15	10	8
R	42	15	18	6

Problem 6.

From the following data calculate the total monthly remuneration of each of the three workers *A, B* and *C* :

(i) Standard production per month per worker 1,000 units.
(ii) Actual production during a month : *A* 850 units, *B* 720 units, *C* 960 units.
(iii) Piece work rate per unit of actual production 20 paise.
(iv) Dearness wages ₹ 50 per month (fixed).
(v) House rent allowance ₹ 20 per month (fixed)
(vi) Tiffin allowance ₹ 20 per month (fixed).
(vii) Additional production bonus at the rate of ₹ 5 for each percentage of actual production exceeding 80% of the standard.

Problem 7.

XYZ Ltd. employs its workers for a single shift of 8 hours for 25 days in a month. The company has recently fixed the standard output for a mass production item and introduced an incentive scheme to boost output.

Details of wages payable to the workers are as follows :

(i) Basic wages – piece work wages @ ₹ 2 per unit subject to a guaranteed minimum wages of ₹ 60 per day.

(ii) Dearness allowance at ₹ 40 per day.

(iii) Incentive bonus :

Standard output per day per worker	40 units
Incentive bonus up to 80% efficiency	NIL
Incentive bonus for efficiency above 80%	₹ 50 for every 1% increase above 80%

The details of performance of four workers for the month of January, 2020 are as follows :

Worker	*No. of days worked*	*Output (units)*
A	25	820
B	18	*500*
C	25	910
D	24	780

Calculate the total earnings of each of the workers.

Problem 8.

What will be the earning of a worker at ₹ 0.55 per hour when he takes 140 hours to do a volume of work for which the standard time allowed is 200 hours ? The plan of payment of bonus is on a sliding scale as under :

Within the first	10%	of	saving	in	standard	time,	bonus	is	40%	of	time	saved
Within the second	10%	"	"	"	"	"	"	"	50%	"	"	"
Within the third	10%	"	"	"	"	"	"	"	60%	"	"	"
Within the fourth	10%	"	"	"	"	"	"	"	70%	"	"	"
For the rest	10%	"	"	"	"	"	"	"	75%	"	"	"

Problem 9.

From the following details calculate the total earnings of a worker and the effective hourly rate of labour wages where bonus is paid under : (a) The Halsey (50%) ; (b) The Rowan scheme:

Basic rate of wages per hour	₹ 3.60
Time allowed for the job	16 hours
Time actually taken	12 hours

Problem 10.

A worker takes 80 hours to do a job for which the time allowed is 100 hours. His daily rate is ₹ 2.50 per hour. Calculate the works cost of the job under the following methods of payment of wages : (a) Time rate ; (b) Piece rate ; (c) Halsey plan ; (d) Rowan plan.

Additional information :

(i) Material cost ₹ 120.

(ii) Factory overhead 125% of wages.

Problem 11.

A worker whose basic rate of pay is 60 paise per hour is working under a 50 : 50 Halsey premium bonus scheme. Besides, he gets a dearness allowance of ₹ 2 per day of 8 hours. Calculate his total earnings and the effective rate of earning per hour for executing a piece of work in 40 hours as against 52 hours allowed.

Problem 12.

In an organization, where Halsey plan is in operation Shrameek Babu can earn ₹ 27.00 on a job for which he takes 8 hours time. Rate of wages is ₹ 3.00 per hour.

Calculate what will be his earnings if Rowan plan is adopted.

Problem 13.

The standard output of a certain product is fixed (by applying the principles of the time and motion study) at 2,000 units per day of 8 hours.

Calculate the earnings of a worker who produces 2,750 units per day under the Halsey premium bonus scheme (40% to worker). The standard rate per day is ₹ 6.40.

Problem 14.

Wage negotiations are going on in a company with the recognized labour union and the management requests you as the cost accountant of the company to formulate an incentive wage scheme with a view to increasing productivity.

The case of three representatives *X, Y* and *Z* – who produce respectively 1,500 units 1,200 units and 900 units in a normal week of 40 hours is taken up for study.

Assuming that day wages would be guaranteed at ₹ 5 per hour and the piece rate would be based on a standard hourly output of 25 units, calculate the earnings and labour cost per 100 pieces of each of the above three workers under : (i) Piece-work with a guaranteed weekly wage ; (ii) Halsey premium plan ; and (iii) Rowan premium plan.

Also calculate the average wage cost for the company to produce 100 pieces under each of the above methods.

Problem 15.

An operator engaged in machining certain components received an ordinary day rate of ₹ 1.60 per day of 8 hours. The standard output for machining the components has been fixed at 80 pieces per hour (time as fixed for premium bonus). On a certain day, the output of the worker on the machine is 800 pieces.

Find the labour cost per 100 pieces and the wages that would have been actually earned by the workman under the following :

(a) If a bonus of ₹ 0.23 is paid per 100 of the extra output.

(b) If paid for on straight piece work basis at the standard rate.

(C) If Halsey premium bonus system is being adopted.

Problem 16.

Pradeep Kar working under a bonus scheme saves 12 hours in a job for which the standard time is 60 hours. Calculate the rate per hour worked and wages payable to Pradeep Kar if incentive bonus of 10% on the hourly rate is payable when standard time (namely 100% efficiency) is achieved, and a further incentive bonus of 1% for each additional percentage in excess of that 100% efficiency is payable. Normal rate of wages is ₹ 5 per hour.

Problem 17.

The production section of a factory working on the job-order system pays their workers under the Rowan premium bonus scheme. Workers also get a dearness allowance of ₹ 250 per week of 48 hours.

A worker's basic wage is ₹ 100 per day of 8 hours and his time sheet for a week is summarized below :

Job No.	*Time allowed*	*Time taken*
1001	25 hours	20 hours
1013	30 hours	20 hours
Idle time *(waiting)*		8 hours
		48 hours

Calculate the gross wages he has earned for the week and indicate the accounts to which the wage amounts will be debited.

Problem 18.

In an assembly shop of a motor cycle factory, 4 workmen *A, B C* and *D* work together as a team and are paid on group piece-rate. They also work individually on day rate jobs. In a 44-hour week the following hours have been spent by *A, B, C* and *D* on group piece-work, viz., *A* 40 hours, *B* 40 hours, *C* 30 hours, and *D* 20 hours. The balance of the time has been booked by each worker on day work jobs. Their hourly rates are :

A ₹ *3.00* *B* ₹ *4.50* *C* ₹ *6.00* *D* ₹ *6.00*

The group piece-rate is ₹ 6.00 per unit and the team has produced 150 units.
Calculate the gross weekly earning of each workman taking into consideration that each individual is entitled to dearness allowance of ₹ 50.00 per week.

Problem 19.

For a certain work order the standard time is 20 hours, wage ₹ 5 per hour, the actual time taken is 13 hours and factory overhead charges are 80% of direct wages for standard time. Set out a comparative statement showing the effect of paying wages on : (i) The Halsey, and (ii) The Rowan incentive bonus systems.

Problem 20.

In a bonus system, bonus hours are credited to the employee in the proportion of time taken which time saved bears to time allowed. Jobs are carried forward form one week to another. No overtime is worked and payment is made in full for all units worked on, including those subsequently rejected.
From the following information you are required to calculate for each employee : (a) The bonus hours and the amount of bonus earned ; (b) The total wage costs ; (c) The wage cost of each good unit produced.

Employee	*A*	*B*	*C*
Basic wage rate per hour	₹ 0.50	₹ 0.80	₹ 0.75
Units issued for production	2,500	2,200	3,600
Time allowed for 100 units	2 hours 36 minutes	3 hours	1 hour 30 minutes
Time taken	52 hours	75 hours	48 hours
Rejects	100 units	40 units	400 units

Problem 21.

A skilled worker in Kee Pee Ltd. is paid a guaranteed wage rate of ₹ 30 per hour. The standard time per unit for a particular product is 40 hours. Ramkumar, a worker, is paid wages under the Rowan incentive scheme and he has earned an effective hourly rate of ₹ 37.50 on the manufacture of that particular product.
What would have been his total earnings and effective hourly rate, had he been put on the Halsey incentive scheme (50%) ?

Problem 22.

Calculate the normal and overtime wages payable to a workman on the basis of the following particulars :

Days	*Hours worked*
Monday	9
Tuesday	8
Wednesday	10
Thursday	11
Friday	9
Saturday	5

Normal working hours are 8 hours per day and the normal rate of wages is ₹ 1.25 per hour. Overtime pay is at the undernoted rate :
Upto 9 hours in a day at single rate and over 9 hours in a day at double rate, or upto 48 hours in a week at single rate and over 48 hours at double rate whichever is more beneficial to the workman.

Problem 23.

From the following data given by the personnel department calculate the labour turnover rate by applying : (a) Separation method ; (b) Replacement method ; (c) Flux method.
Number of workers on the pay-roll :

At the beginning of the month	900
At the end of the month	1,100

During the month, 10 workers left, 40 workers 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.

Problem 24.

The following information relates to workforce in a factory during the year 2019-20.

Number of workers on April 1, 2019	2,350
Number of workers on March 31, 2020	2,850
Number of workers who quit on their own	200
Number of workers who availed golden handshake opportunity	100
Number of workers employed during 2019-20 including	
700 workers employed due to expansion	800

Calculate annual labour turnover rate and equivalent monthly turnover rate under different methods.

Problem 25.

The cost accountant of TRS Ltd. has computed labour turnover rates for the quarter ending 31st March, 2019 as 2.5% and 5% respectively under 'Replacement method' and 'Separation method' Number of workers at the end of the quarter is 200 more than the number at the beginning and number of workers replaced during the quarter is 25.

You are required to find out the number of :
(a) Workers at the beginning and at the end of the quarter ; and (b) Workers left and discharged during the quarter.

Problem 26.

The cost accountant of Y Ltd. has computer labour turnover rates for the quarter ended 31st March, 2019 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 : (i) Workers recruited ; and joined, and (ii) Workers left and discharged.

OVERHEAD

Problem 1.

Units produced and overheads incurred during the two periods were as follows :

Month	*Units*	*Overheads*
April	20,000	₹ 60,000
May	22,000	₹ 63,000

Calculate : (i) Total fixed overhead, and (ii) Variable overhead per unit.

Problem 2.

A manufacturing company provides you with a summary of its production costs at three production levels :

Cost item	*1,000 units*	*2,000 units*	*3,000 units*
	₹	₹	₹
A	5,000	5,000	5,000
B	1,400	1,800	2,200
C	3,000	6,000	9,000

(i) Indicate the cost behaviour for the cost items.
(ii) What would be total costs if the company produces 2,500 units ?

Problem 3.

The following are the maintenance costs incurred in a machine shop for six months with corresponding machine hours :

Month	*Machine hours*	*Maintenance costs*
	₹	₹
January	1,800	1,400
February	1,300	1,150

March	2,000	1,500
April	1,900	1,450
May	1,600	1,300
June	1,400	1,200
Total	10,000	8,000

Analyse the maintenance cost (which is semi -variable) into fixed and variable elements using : (i) the high/low points method ; and (ii) the least square method.

Problem 4.

The following information relates to the activities of a production department of a factory for a certain period :

	₹	Hours
Materials issued	36,000	
Direct wages	30,000	
Direct labour hours worked		25,000
Hours of machine operation		20,000
Overheads chargeable to the department	25,000	

If the cost of material consumed on Job No. 253 is ₹ 2,000 and labour charges amount to ₹ 1,650, ascertain the works cost by the following methods of allocating overheads :
(a) Percentage on direct wages ; *(b)* Machine hour rate ; *(c)* Direct labour hour rate.
Presume that labour hours worked for the job were 1,650 and hours of machine operated for the job were 1,200.

Problem 5.

The following is the budget of a manufacturing concern for the year 2019 :

Factory overheads	1,24,000
Direct labour hours	1,96,000
Direct labour hours	3,10,000
Machine hours	10,000

(a) From the above figures, compute the overhead application rates, using the following methods : *(i)* Direct labour hours ; *(ii)* Direct labour cost ; *(iii)* Machine hours.
(b) Prepare a comparative statement of cost, showing the result of application of the above rates to Job No. 551 from the undermentioned data :

Direct material cost	₹ 90
Direct labour cost	₹ 150
Direct labour hours	180
Machine hours	60

(c) In this case which method do you think to be appropriate ?

Problem 6.

Department *X* makes two products *A* and *B.* The departmental budgeted overheads for *X* are ₹ 48,000, and the budgeted production is *A* 4,000 units, *B* 1,600 units.

The estimated prime cost per unit of *A* and *B* was calculated as below :

Product A	₹	***Product B***	₹
Material 48 kg. of code 562 at ₹ 0.25 per kg.	12.00	30 kg. of code 253 at ₹ 0.20 per kg.	6.00
Labour 5 hours (of which 2 hours are on a machine) at ₹ 0.80 per hour	4.00	25 hours (of which 10 hours are on a machine) at ₹ 0.40 per hour	10.00
	16.00		16.00

Calculate three different overhead recovery rates and show the overhead for 1 unit of *A* and also 1 unit of *B.*

Problem 7.

A machine shop contains four newly purchased machines, each occupying practically equal area and costing respectively : *A* ₹ 10,000*, B* ₹ 12,500*, C* ₹ 15,000 and D ₹ 20,000.

The following are the expenses per annum of the machine shop :

Rent ₹ 5,000 ; Rates and water ₹ 2,125 ; Light and heat ₹ 1,575 ; Power : *A* ₹ 2,550, *B* ₹ 2,500, *C* ₹ *6,000, D* ₹ 7,250 ; Administration ₹ 4,750 ; Running expenses, works sundries, lubricating, repairs etc. ₹ 10,000.

Prepare machine hour rate for each machine, assuming a 44-hour week, 50 weeks per year, 80% utilization and the life of machines being 10 years without any scrap value.

Problem 8.

Particulars of 3 machines used in a factory are as under (six-week period : 160 hours working) :

	Machine No. 1	*Machine No. 2*	*Machine No. 3*
Cost of machine (₹)	10,000	15,000	20,000
Number of workers	2	5	10
Direct wages (₹)	300	800	1,200
Power (₹)	45	80	150
Light points	2	4	6
Area occupied (sq. metres)	100	250	400

The expenses incurred during the period were as follows :	₹
Power	275
Lighting	48
Rent and rates	450
Depreciation	1,350

Repairs	1,800
Indirect wages	460
Canteen expenses	51
Sundries	300

Compute the machine-hour rate for each machine.

Problem 9.

The Enfield India Ltd. Is divided into four departments : *A, B* and *C* are production departments and a service department. The actual costs for October, 2019 are as follows :

	₹
Rent	1,000
Repairs to plant	600
Depreciation of plant	450
Light	100
Supervision	1,500
Fire insurance (stock)	500
Power	900
Employer's State Insurance Contribution	150

The following information is available in respect of the four department :

	A	*B*	*C*	*D*
Area (sq. metre)	1,500	1,100	900	500
No. of employees	20	15	10	5
Direct wages (₹)	6,000	4,000	3,000	2,000
Value of plant (₹)	24,000	18,000	12,000	6,000
Value of stock (₹)	15,000	9,000	6,000	-

Apportion the costs to the various departments by preparing overhead distribution summary sheet.

Problem 10.

A company has three production departments *A, B* and *C* and a service department *S.* The overhead costs incurred during a particular four-week period were :

		₹
Indirect wages and salaries :		
Department *A*	40,000	
Department *B*	30,000	
Department *C*	35,000	
Department *S*	25,000	1,30,000
Workmen's compensation insurance		7,800

Rent and rates	6,000
Repairs to plant and machinery	6,000
Depreciation of plant and machinery	4,500
Electricity	3,000
Power	5,600
Insurance	3,500
Medical costs	240

The following information is also available :

	Dept. *A*	Dept. *B*	Dept. C	Dept. *S*
Area in square metre	10,000	8,000	7,000	5,000
Number of employees	20	12	15	13
Book value of plant and machinery	₹ 1,00,000	₹ 1,20,000	₹ 60,000	₹ 20,000
Average stock value	₹ 20,000	₹ 15,000	₹ 15,000	
Horse power of machines	120	95	55	10

Carry out the allocation and apportionment of overhead to the production departments assuming that, service department *S* is a canteen.

Problem 11.

Calcutta Engineering Co. has three production departments *X, Y* and *Z* and one service department *S.* From the following particulars calculate labour hour rate of each of the departments *X, Y* and *Z* :

Expenses :	₹
Rent	34,000
Power	18,400
Depreciation on machinery	22,000
Indirect wages	5,300
Canteen Expenses	5,700
Electricity	4,600

Further information :	*X*	*Y*	*Z*	*S*
Floor space (sq. metre)	2,000	3,000	2,500	1,000
Light points	18	12	10	6
Cost of machines (₹)	80,000	50,000	60,000	10,000
Horse power hours ratio	3	2	4	1
No. of workers	7	5	5	2
Direct wages (₹)	15,000	16,000	18,000	4,000

There were 125 working days of 8 hours each. Services rendered by the service department are to be apportioned to the production departments as *X* 50%, *Y* 25% and *Z* 25%.

Problem 12.

MRK Ltd. has three production departments : $X1$, *X*2 and *X*3 and two service departments : *S*1 and *S*2. The following figures are extracted from the records of the company for a particular period :

Rent and rates	₹ 5,000	Power	₹ 1,500
Depreciation in machinery	₹ 10,000	Canteen expenses	₹ 650
Lighting expenses	₹ 600	Sundry expenses	₹ 10,000

Other information :	*X1*	*X2*	*X3*	*S1*	*S2*
Floor area (sq.ft.)	2,000	2,500	3,000	2,000	500
No. of light points	10	15	20	10	5
No. of employees	25	20	10	5	5
Direct wages (₹)	3,000	2,000	3,000	15,000	500
Indirect wages (₹)	250	500	100	250	150
H.P. of machines	60	30	50	10	
Value of machines (₹)	60,000	80,000	1,00,000	5,000	5,000
Production hours worked	2,000	2,500	3,000	-	-

Expenses of service departments are apportioned as below :

	X1	*X2*	*X3*	*S1*	*S2*
S1	2	2	1	-	-
S2	2	1	2	-	-

You are required to :

(a) Compute overhead absorption rate per production hour of each department.

(b) Determine total cost of product " *YZ* " which is processed through departments *X1, X2* and *X3* for 5 hours, 4 hours and 3 hours respectively. The material cost for the product " *YZ* " is ₹ 5,000 ; direct labour cost is ₹ 20,000, royalty on production ₹ 2,000 and chargeable expenses ₹ 1,000.

Problem 13.

A manufacturing company produces various articles. The amount of overhead expenses incurred by the different departments are stated below :

	Amount of expenses ₹	*Amount of direct labour* ₹	*No. of hours worked*	*Floor space sq. metre*	*Power consumed kw.*
Service departments :					

Maintenance	9,600	-	-	-	-
Building service	12,000	-	1,000	-	-
Power	4,000	-	400	2,000	-
Production departments :					
Cutting	16,000	14,660	1,600	4,000	3,60,000
Assembly	8,000	13,520	1,800	8,000	40,000

The service department costs are distributed to other service departments and to the production departments in the order shown above. The basis of distribution of costs is as follows :

Overhead expenses of	*Basis of distribution*
Maintenance department	Hours worked in other departments
Building service department	Floor space
Power department	Power consumption

Draw up a statement of apportionment of overhead expenses and work out the percentage of overhead expenses on direcct labour, separately in respect of Cutting and Assembly shops.

Problem 14.

A company with three production departments and two service departments has the following balances on a departmental distribution summary of expenses :

Production departments :		*Service departments :*	
Manufacturing	₹ 48,000	Power	₹ 6,000
Assembly	₹ 42,000	Administration	₹ 10,000
Finishing	₹ 36,000		

The expenses of the service departments are charged out on the following basis :

Service departments	*Production departments*			*Service departments*	
	Manufacturing	Assembly	Finishing	*Power*	*Administration*
Power	40%	25%	15%	-	20%
Administration	35%	30%	0	15%	-

You are required to show the apportionment of service departments expenses to the production departments by any two appropriate methods.

Problem 15.

A company has three production departments *A, B, C* and two service departments *D* and *E.* The following figures are extracted from the records of the company :

	₹
Rent and rates	5,000
General lighting	600
Indirect wages	1,500
Power	1,500
Depreciation of machinery	10,000
Sundries	10,000

The following further details are available :

	A	*B*	*C*	*D*	*E*
Floor space (sq. metre)	2,000	2,500	3,000	2,000	500
Light points (Nos.)	10	15	20	10	5
Direct wages (₹)	3,000	2,000	3,000	1,500	500
H.P. of machines	60	30	50	10	-
Value of machinery (₹)	60,000	80,000	1,00,000	5,000	5,000
Working hours	6,226	4,028	4,066	-	-

The expenses of *D* and *E* are allocated as follows :

	A	*B*	*C*	*D*	*E*
D	20%	30%	40%	-	10%
E	40%	20%	30%	10%	-

What is the total cost an article, if its raw material cost is ₹ 50, labour cost is ₹ 30 and it passes through Departments *A, B* and *C* for 4, 5 and 3 hours respectively ?

MACHINE HOUR RATE(OVERHEAD)

Problem 1.

A machine was purchased on January 1, 2019 for ₹ 5 lakh. The total cost of all machinery inclusive of the new machine was ₹ 75 lakh. The following further particulars are available :

Expected life of the machine	10 years
Scrap value at the end of ten years	₹ 5,000
Repairs and maintenance for the machine during the period of ten years	₹ 20,000
Expected number of working hours of the machine per year	4,000 hours
Insurance premium annually for all the machines	₹ 4,500

Electricity consumption for the machine per hour (@ 75 paise per unit)	25 units
Area occupied by the machine	100 sq.m.
Area occupied by other machines	1,500 sq.m.
Rent per month for the department	₹ 800
Lighting charges for twenty points for the whole department out of which three points are for the machine	₹ 120

Compute the machine hour rate for the new machine on the basis of the data given above.

Problem 2.

Compute machine hour rate of a machine in a shop consisting of 3 machines occupying equal floor space. Following details are supplied for the machine of which estimated working hours per year are fixed at 2,500 hours in which normal idle time is estimated at 20% of the standard time.

	₹
Rent and taxes of the shop per annum	3,600
General electricity for the shop per month	200
Repairs and maintenance expenses for the machine per annum	600
Rate of power charges for 100 units (the machine consuming 10 units per hour)	3
Foreman's salary for supervising all the machines per month	750
Indirect labour cost ₹ 2 per hour for the machine.	

The machine costs ₹ 1,30,000 and scrap value is estimated at ₹ 10,000 and estimated life is 10 years.

The foreman devotes equal attention to each machine in the shop.

Problem 3.

The machines *P, Q* and *R* which are of different nature are used in a department of a factory. From the following information, compute machine hour rate of machine *R* :

(i) Total cost of machine *P, Q* and *R* is ₹ 50,000, out of which cost of machine *R* is ₹ 10,000. Its estimated scrap value and working life are ₹ 1,000 and 18,000 hours respectively	
(ii) Rent (total area 1,000 sq.ft. and machine *R* occupies 250 sq.ft.)	₹ 780 p.a.
(iii) Lighting (total light points 12, out of which 2 points used for machine *R*)	₹ 288 p.a.
(iv) Insurance for all machines	₹ 45 per quarter
(v) Consumable stores for machine *R*	₹ 60 p.m.
(vi) Salary of supervision (supervisor devotes $\frac{1}{4}$th of his time for machine *R*)	₹ 6,000 p.a.
(vii) Repairs and maintenance for the entire life of machine *R*	₹ 1,800
(viii) Machine *R* consumes 5 units of power per hour at a cost	₹ 16 per 100 units

(ix) Machine *R* will work 2,000 hours p.a., out of which normal idle time estimated at 8% of total working hours and time for routine maintenance estimated at 40 hours p.a.

Problem 4.

From the following particulars, calculate machine hour rate :

Cost of the machine	₹ 2,00,000
Intallaltion charges	₹ 20,000
Rent of the shop per month	₹ 3,000
Insurance premium for the machine per annum	1% of capital cost
Electricity charges for the shop per month	₹ 300
Repairs and maintenance per month	0.5 % of capital cost
Supervisor's salary per month	₹ 1,800
Rate of power charges for 100 units	₹ 55
(The machine consumes 16 units of power per hour.)	

The machine occupies $^{1}/_{3}$rd of the shop area. Its life is 10 years and anticipated scrap value is ₹ 10,000. The supervisor devotes $^{1}/_{4}$th of his time to the machine.

Estimated idle time : 50 hours in a year

Normal working days during a year : 250 days of 8 hours ; 50 days of 5 hours.

Problem 5.

The following annual charges are incurred in respect of 2 machine in a shop where manual labour is almost nil and where work is done by means of five machines of exactly similar type and specification :

		₹
1	Rent and rates (proportional to the floor space occupied) for the shop	4,800
2	Depreciation on each machine	500
3	Repairs and maintenance for the five machines	1,000
4	Power consumed (as per meter) @ 5 paise per unit for the shop	3,000
5	Electricity charges for lights in the shop	540
6	Attendants :	
	There are two attendants for the five machine and they are paid @ ₹ 60 p.m. each,	
7	Supervision :	
	For the five machines in the shop there is one supervisor whose emoluments are ₹ 250 p.m.	
8	Sundry supplies such as lubricants, jute and cotton waste etc. for the shop	450
9	Hire purchase instalment payable for the machine (including ₹ 300 as interest)	1,200

The machine uses 10 units of power per hour.

Calculate the machine hour rate for the machine for the year.