UNIT - II (III)

RATE ANALYSIS

Rate Analysis :-

The process of determining the rate per unit of particular item by examining the cost of quantities, material, labour, overhead charges, rent of tools and plant, contractor's profit etc., are known as rate analysis.

Sundries

Sundries is the amount required for purchasing of tools which are used in operations of items works. Generally, the sundries expenditure are equal to 1% of total rate of items.

Need Purpose of rate analysis

1) By analysis the rate of item, actual cost per unit of the items are required.
2) Economical use of material and processes involved in making the item are determined through the rate analysis
3) Extra cost of items apart from contractors bond are determined by rate analysis.
4) Rate analysis revise the schedule of rate due to increase in cost of material and labour.

Requirements of rate analysis.

1) Market rates of various elements of (or) tools are requires to be known.

2) Rate for different type of labours are need to be known correctly.
3) Labour force for different task per day have to be known.
4) In the construction work, it is require to known about the knowledge, rate of material and labours, our turn of various plants etc.
5) Up to date knowledge of construction work are required to be known.

Standard data book:- The quantities of materials, machinery and men required per unit of various finished items of work are given in the "Data book". All the Engg department have to follow the same.

Standard schedule of Rates :-

In schedule of rates the rates of various materials machinery hiring (rent) charges and wages of labours are available and is prepared by Board of chief engineers and approve it for that year. Generally schedule of rates from June 1st of every year it will be prepared.

Standard data sheet:- The rates of various items of work are worked out in the standard format is known as standard data sheet

S.NO	Quantity	Description of item	Rate	per	Amount

Cost of materials at source :- The basic rates of various materials given in S.S.R are the rates at the place of manufacture of production (or) available in nature (or) factory and is fixed by the respective authorities by considering nature, source of materials, availability of raw material, taxes etc. This cost is known as cost of materials at source :-

Cost of materials at site :- Cost of materials at site is the cost of material at source plus conveyance allowance charges of the material from the source to the site of work including loading, unloading, road, tax, toll gate fee etc.

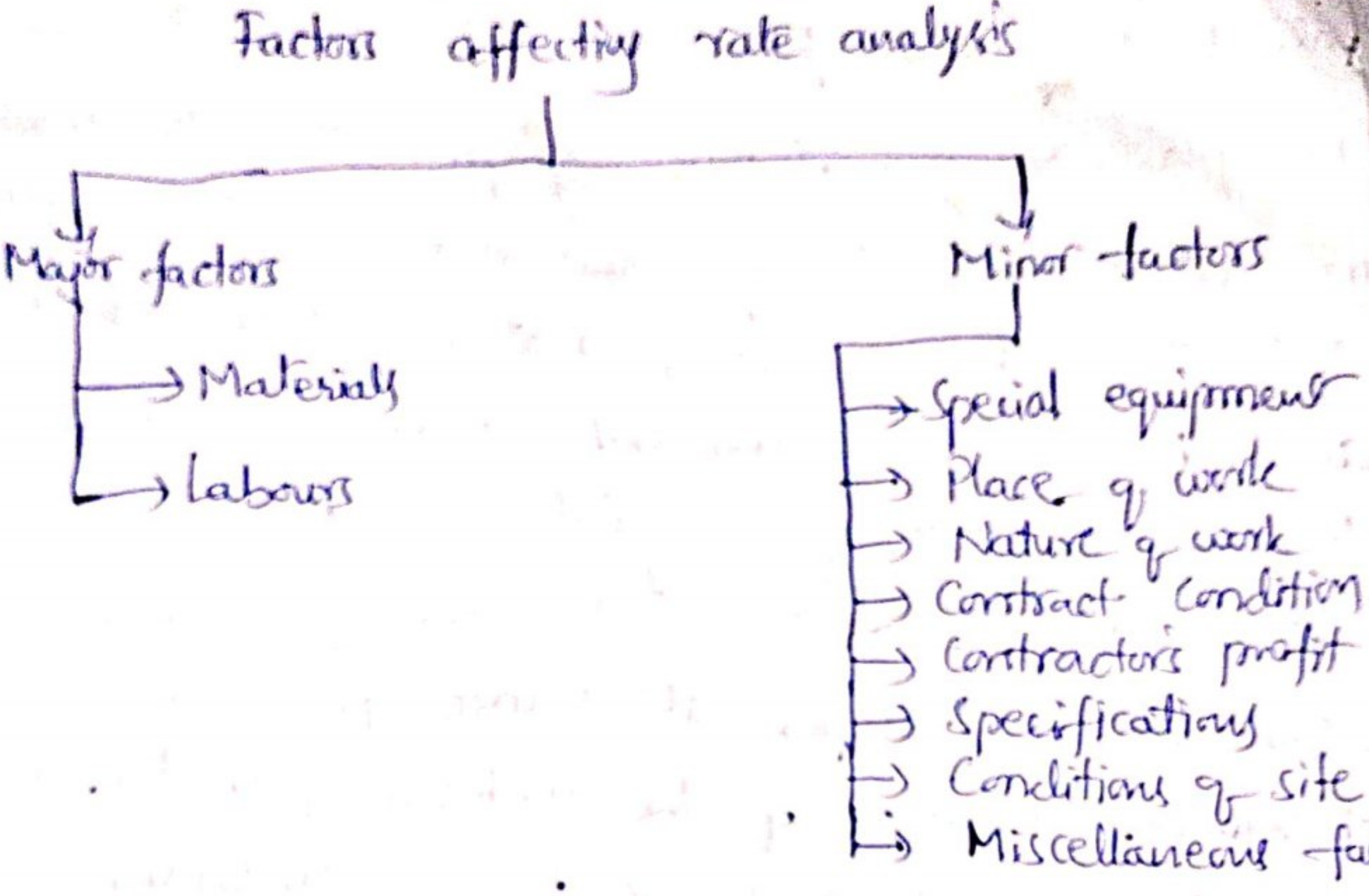
Lead :- Lead is the distance b/w source of material to the worksite. This lead distance charges from one project to another project depends upon its location.

Lead charges :- The conveyance charges of the materials from source to the site of work is called lead charge. The lead charges very for different types of road surface. The lead charges given in S.S.R are for Metalled roads. For sandy track and cart tracks we have to multiply with constant to get the equivalent lead on metalled road.

For cart track = Lead x 1.1

For sandy track = Lead x 1.4.

Factors affecting the rate analysis



Overhead Charges :— The overhead charges in rate analysis include rents, office expenses, supervision, taxes, & other costs which are indirect expenses on the job.

The other expenses on overheads may be under the following heads.

1) General overheads.

(i) Travelling expenses (ii) Establishment

(iii) Stationary, postages, printing (iv) Rent & taxes

(v) Telephone.

2) Job overheads

(i) Handling of materials (2) Amenities of labour

(iii) Supervision (iv) Interest on investment

(v) Workmens Compensation, insurance etc.

(vi) Losses on advances.

Find the cost of materials at site ③

S. No	Materials	Cost at source	Per	Lead	conveyance charges
1	20mm size HBG metal	Rs. 650/-	1 m³	26 km	Rs. 8.50/- per m³/km
2	Cement	Rs. 3800/-	1 Tonne	6 km	Rs. 2.00 /bag/km.

1:-

S.No	Materials	Cost at Source	Per	Lead	Conveyance Charges	Total conveyance Charges	Cost at site
1.	20mm HBG metal	Rs. 650/-	1 m³	26 km	8.50/m³/km	221.00	871.00/m³
2.	Cement	Rs. 3800/-	1T	6 km	Rs. 2.00/bag/km (or) Rs. 40.00/1MT	240.00	Rs. 4040/-T (or) 5817.6/m³

1T ⇒ 1

1 m³ = 1440 kgs.

1T = 1000 kgs.

1T = 1440/1000

1T = 1.44 m³

1T = 1000 kg

1 bag = 50 kg.

No. of bags = 1000/50

= 20 bags.

2) Find the cost of materials at site for the following items:

S.NO	Material	Cost at Source	Lead	Conveyance Charges
1.	HBG metal 20 mm size	220.00/m³	15 km (MR)	3.00/m³/km.
2.	Sand	40.00/m³	5 km (C.T)	2.00/m³/km
3.	Cement	120.00/kN	2km (ME)	1.00/kN/km

S.No	Materials	cost at source	Per	Lead	Conveyance Charges	Total Conveyance Charges	Cost at site
1.	20mm HBG metal	220/-	$1m^3$	15 km (MR)	~~45.00~~ 3.00/-m^3	45.00	265.00/-m^3
2.	Sand	40/-	$1m^3$	5km (CT) 5×1.1=6	2.00/-	11.00	51.00/-m^3
3.	Cement	120/-	KN	2 km (MR)	1.00/-kN	2.00	122.00/- km/kN.

1 kN = 101.93

1 kN = 1000 N

$1 m^3$ = 1440 kg.

1 kg = 9.81 N.

$1kN = \frac{1000}{9.81}$

1 kN = 101.93 kg

$\therefore 122 \times \frac{1440}{101.93}$ 122 kN =

= 1723.53/- m^3

* Prepare a data sheet and calculate the cost of the ~~25~~ items given below.

a) C.C(1:4:8) using 40mm HBG metal - $1m^3$.

b) R.R masonry in CM(1:6) - $1m^3$.

Materials and labour required for $1m^3$.

C.C. (1:4:8)

0.92 m^3 HBG metal

0.48 m^3 Sand

0.115 m^3 cement

0.~~15~~ 6 NOS Mason 1st Class

0.14 NOS Mason IInd class.

L.S. Sundries

R.R Masonry in CM(1:6)

1.10 m^3 rough stone

0.34 m^3 CM(1:6)

1.5 × 0.3 = 0.54

1.5 × 0.7 = 1.26

2.5 NOS Mason 1st class

Mason IInd "

Mazdoors

L.S Sundries

Labour charges per day.

Mason 1st Class — 500.00/- Hand mixing charges of CM per m^3 = 80.00/-

Mason IInd " - 450.00/-

Mazdoor = 300.00/-

Calculate the quantity of any ... in one

S.No	Materials	Rate	Per	Lead	Conveyance charges	Total conveyance charges	Cost of materials at site.
1.	40mm size HBG metal	1100/-	$1m^3$	10km (MR)	2.00/-1km		
2.	Sand	400.00/-	$1m^3$	8km (MR)	2.00/-1km		
3.	Rough stone	16.50/-	$1m^3$	5km (MR)	3.00/-1km		
4.	Cement	12000	1T	At site.			

Sol:-

S.No	Materials	Rate	Per	Lead	Conveyance Charges	Total Conveyance Charges	Cost materials at site.
1.	40mm size HBG metal	1100.00	$1m^3$	10 km (MR)	2.00/-km	20.00/-	1120.00/-
2.	Sand	400.00	$1m^3$	8 km (MR)	2.00/-km	16.00/-	416.00/-
3.	Rough stone	16.50	$1m^3$	5km	3.00/-km	15.00/-	31.50/-
4.	Cement	1200.00/	1T	At site	-	-	1200.00/- 1T (or) 1728.00/- m^3

1.0

$1T = 1000kg.$

$1m^3 = 1440kg.$

$1200.00 \times 1.44 = 1728 m^3.$

$1T = \frac{1440}{1000}$

$\boxed{1T = 1.44m^3}$

Data sheet for R.R Masonry in CM (1:6) for $1m^3$.

Quantity	Material	Rate	Per	Amount
1) $1\ m^3$	Sand	416.00	$1m^3$	416.00
$\frac{1}{6}\ m^3$	Cement	1728.00	$1m^3$	288.00
$1\ m^3$	Mixing charges	80.00	$1\ m^3$	80.00
			Total =	784.00

a) Data Sheet for C.C (1:4:8) using 40mm HBG meta for $1m^3$:

Quantity	Material	Rate	Per	Amount	
1) $0.92\ m^3$	HBG metal	1120.00/-	$1m^3$	1030.40/-	
$0.48\ m^3$	Sand	416.00/-	$1m^3$	199.68/-	
$0.115\ m^3$	Cement	1728.00/-	$1m^3$	198.72/-	
0.06 No.	Mason I st class	500.00	day	30. 250.00/-	
0.14 No.	Mason II nd class	450.00	day	630.00	
3.2 Nos	Mazdoors	300.00	day	960.00/-	2481.8
L.S	Sundries	—	—	18.20/-	
				2500.00/-	

b) Data Sheet for R.R Masonry in CM (1:6) for $1m^3$.

Quantity	Material	Rate	Per	Amount
$1.10\ m^3$	Rough stone	31.50	$1m^3$	34.65/-
$0.34\ m^3$	CM (1:6)	784.00	$1m^3$	266.56/-
0.54 NO	Mason I st class	500.00	day	270.00/-
1.26 NO.	Mason II nd class	450.00	day	567.00/-
2.8 No.	Mazdoor	300.00	day	8000.00/-
L.S.	Sundries	—	—	21.79/-
				2000.00/-

1) Calculate the quantity of dry ingredients in one cubic meter of concrete mix (1:2:4). (5)

Sol:

Given

1 cubic meter of concrete.

Concrete mix proportion = 1:2:4.

Total volume of mix = 1+2+4 = 7 cum.

$$\text{Quantity of material} = \frac{\text{Ratio of material} \times 1.54}{\text{Total volume of mix}}.$$

$$\text{No. of bags of cement} = \frac{\text{Quantity of cement}}{\text{Volume of one bag of cement}}$$

For 1:2:4 mix, the volume of one bag of cement is equal to 0.034 cub.mt (1 cum = 30 bags, 1 bag = $\frac{1}{30}$ = 0.034 cubmt)

where 1.54 is the dry quantity of one cubmt of concrete.

$$\text{Quantity of cement} = \frac{1 \times 1.54}{7} = 0.22\ m^3.$$

$$\text{No. of bags of cement} = \frac{0.22 \times 1440}{50}$$

$$= 6.336 \text{ bags.}$$

(or)

$$= \frac{0.22}{0.034} \Rightarrow 6.471 \text{ bags.}$$

1 cum = 1440 kgs.
1 bag = 50 kgs.
1 cum = 30 bags.
1 bag cement of 50 kg = $\frac{1}{30}$ = 0.034 cum

$$\text{Quantity of sand} = \frac{2 \times 1.54}{7}.$$

$$= 0.44 \text{ cub.mt}$$

$$\text{Quantity of coarse aggregate} = \frac{4 \times 1.54}{7}$$

$$= 0.88 \text{ cumt.}$$

There is a reduction in volume of finished concrete

compared to the dry volume of materials by 50 to 60%. Hence for 1.00 cum of finished concrete the sum total volume of dry ingredients materials may be taken as 1.60 cum.

1) Materials required for C.C (1:2:4)

→ Quantity of finished Concrete = 1 cum

Dry quantity of materials = 1.60 cum $\left(1+\frac{60}{100}\right)$

Volume of cement $= \frac{1.60}{1+2+4} = \frac{1.6}{7} = 0.228$ cum
$= 0.23$ cum

1 Cum of portland cement = 1440 kgs.

Cement in bags $= \frac{0.23 \times 1440}{50} = 6.63$ bags.

Volume of fine aggregate $= 0.23 \times 2 = 0.46$ cum

Volume of coarse " $= 0.46 \times 2 = 0.92$ cum.

* Determine the rate analysis of Lime Concrete in foundation with 40 mm gauge brick ballast unit 1 cum. Take 10 cum. for with white lime and surkhi (1:2) (Proportion – 16:32:100, i.e 1:2:6 approximately).

S.NO.	Description of	Quantity	Rate	Per	Amount
	Materials				
1)	Brick ballast 1st class 40 mm gauge	10 cum	650.00	1 cum	6500.00
2.	White lime Slaked	1.6 cum	800.00	1 cum	1280.00
3.	Surkhi	3.2 cum	500.00	1 cum	1600.00
					9380.00

S.NO	Particulars	Quantity	Rate	Per	Amount (6)
	Labour:				
1)	Mistri (Head mason) (Skilled labour)	0.5 no.	350.00	Day	175.00
2)	Mason	1.0 no.	300.00	Day	300.00
3)	Mazdoor (unskilled labour) (~~Belder~~)	12 nos.	220.00	Day	2640.00
4.	Boy (or) Woman Coolie	12 nos.	200.00	Day	2400.00
5.	Bhishti (water man)	2 nos.	200.00	Day	400.00
6.	Lumpsum	Sundries		—	85.00
					6000.00
					9380.00
	Total of materials & labours				15380.00
	Add 1½ % water charges $(\frac{1.5}{100} \times 15380)$				230.70
	Add 10% Contractor's profit $(\frac{10}{100} \times 15380)$				1538.00
					17149.00 for 10 cum.

Working problem

$230.7 \approx 231$

10 cum = 1 cum

Rate per cum = $\frac{17149}{10}$ = 1714.90/-

Approximately calculation of materials for 100 cum

L.C. (1:2:6), Lime = $\frac{150}{1+2+6}$ = 16.6 cum for 1 cum

$16.6 \times 10 = 1.6$

= 1.6 cum for 10 cum

Surkhi = 16.6 × 2 = 32.2 cum for 1 cum, (3.2 cum for 10 cum)

Brick ballast = 16.6 × 6 = 99.6 cum

* Determine the rate analysis for the following items
(a) - Earthwork excavation (b) Cement concrete.

Sol:- a) Ordinary soil per 1 cub.mt.

S.No.	Description of item	Quantity	Rate	Per	Amount
1.	Labour				
	(a) Mistri	0.5 no.	350.00	Day	175.00
	(b) Mazdoor (Beldar)	21 no.	220.00	Day	4620.00
	c) Bay (a) woman coolie (a) (Bhisti)	25 nos.	200.00	Day	5000.00
	d) Blacksmith for tools & sharpening	0.5 no.	300.00	Day	150.00
2.	Materials				
	a) Tools plants & baskets etc.	Lumpsum	—	—	1500.00
					11445.00/-
3.	10% contractors profit $\frac{10}{100} \times 11445$.	—	—	—	1144.50
	$\frac{10}{}$			Total =	12589.50

Rate per cum. $\frac{12589.50}{100}$ = 125.895/-

2) ~~Determine the rate analysis~~
Rate analysis for Cement concrete for 10 cum

S.No	Particulars	Quantity	Rate	Per	Amount
1.	Labour				
	a) Mistri	0.5 No	350.00	Day	175.00
	b) Mason	1 No.	300.00	Day	300.00
	c) Bhisti	2 no.	200.00	Day	400.00
	d) Blacksmith	0.5 no	300.00	Day	150.00

2) Rate analysis for Cement concrete for 10 cumt.

S.NO	Particulars	Quantity	Per	Rate	Amount ₹
1)	**Labour**				
	a) Mistry	0.5 no.	Day	565.00	282.50
	b) Mason	0.9 nos.	Day	470.00	423.00
	c) Bhisti	2.7 nos.	Day	450.00	1215.00
	d) Blacksmith	0.5 nos.	Day.	470.00	235.00
	e) Beldar	7 nos.	Day	425.00	2975.00
	f) Coolie (Mazdoor)	10.6 nos.	Day	400.00	4240.00
	g) T&P sundries				9370.50
2)	**Materials**				
	a) Brick ballast 40 mm size	9.6 cum	Cum	650.00	6240.00
	b) Cement (0.84 cum)	24 bags	bag	260.00	6240.00
	c) Sand (fine)	4.8 cum	cum	700.00	3360.00
			Total	=	15840.00
					9370.50
					25210.50
3)	Add 10% contractor's profit	$= \frac{10}{100} \times 25210.5 \Rightarrow$			2521.05
					27731.55

Labour Calculation :—

b) 0.25 Mason — 2.83 cum
— 10 cum
$\Rightarrow \frac{10 \times 0.25}{2.83} \Rightarrow 0.883$
$\Rightarrow 0.9$ no.

e) 3 Maz = 2.83 cum
= 10 cum $\Rightarrow \frac{10 \times 3}{2.83} \Rightarrow 10.6$ nos.

c) 0.75 Bhisti = 2.83 cum
= 10 cum
$\Rightarrow \frac{10 \times 0.75}{2.83} \Rightarrow 2.65 \Rightarrow 2.7$ nos.

d) 2 Beldar = 2.83 cum $\Rightarrow$ ~~3 nos.~~
= 10 cum $\Rightarrow \frac{10 \times 2}{2.83} \Rightarrow 7.0$ no

Materials Calculation Take proportion C.C (1:6:12)

* Approximate take finished materials = 100 cum.

dry volume of materials = $\frac{152}{19}$ 152 (100 + 52%) 50 to 60%

a) Cement = $\frac{152}{19} \times 1 = 8$ cum → 100 cum = 8 cum
= 0.8 cum 10 cum = 0.8 cum

1 cum = 30 bags.
0.8 cum.

b) Sand = $\frac{152}{19} \times 6 = 48$ cum
= 4.8 cum

100 cum = 48 cum
10 cum = ? 4.8 cum

1 bag = 0.034 cum
= 0.8 cum
= $\frac{0.8 \times 1}{0.034}$ = 23.5 = 24 bags

c) C.A = $\frac{152}{19} \times 12 = 96$ cum
= 9.6 cum

100 cum = 96 cum
10 cum = 9.6 cum.

*) Determine the rate analysis for lime concrete in foundation with 40 mm gauge Brick ballast. Take 10 cum : (9) With white lime and surkhi 1:2 (proportion — 16 : 32 : 100 i.e 1:2:6 appro.)

Goes strong foundation in this case use cement
take this proportion also & Brick ballast - (P.C.C)
voids will be present so voids range 40-60%

R.C.C - 40-50%

S.No.	Particulars	Quantity	Per	Rate	Amount
1)	Materials				
	a) Brick ballast I st Class 40mm gauge	10 cum	cum	650.00	6500.00
	b) White lime slaked	1.66	cum	800.00	1328.00
	c) Surkhi	3.32	cum	500.00	1660.00
					9488.00
2)	Labour	½ no			
	a) Misti (Head Mason)	0.5 no.	Day	565.00	282.50
	b) Mason	0.9 nos	Day	470.00	423.00

c) Maz-door	11 nos 10.6 nos.	Day	425.00	4675.00 (8)
d) Boy-(or) Beldar	7 nos	Day	400.00	2800.00
e) Bhisti (water-man)	3 nos.	Day	450.00	2800.00
				10980.50
				9486.00
			Total =	20468.50
Add 1.5% for water charges			$= \frac{1.5}{100} \times 20468.5$	= 307.02775
Add 10% contractors profit			$= \frac{10}{100} \times 20468.5$	= 2046.85
				22822.37775
L.S	Sundries			= 33.3225
				27.62225
				22850.00

Rate per cum = $\frac{22850}{10}$ = 2285.00/-

Calculation of Labours Materials :-

$\frac{100 + 10}{}$

Approximate calculation of materials for 100 cum

Lime concrete mix = 1 : 2 : 6 ⇒ 1+2+6 = 9

Lime = $\frac{150}{9}$ = 16.6 cum

16.6 cum = 100 cum ⇒ $\frac{10 \times 16.6}{100}$ ⇒ 1.66 cum
= 10 cum

Surkhi = $\frac{150}{9} \times 2$ = 33.2 cum, 33.2 cum = 100 cum ⇒ $\frac{10 \times 33.2}{100}$ ⇒ 3.3224
= 10 cum

Brick ballast = $\frac{150}{9} \times 6$ = 100.0 cum. 100 cum = 100 cum ⇒ $\frac{10 \times 100}{100}$ = 10 cum
= 10 cum

Calculation of Labour.

a) Mistri can take by assumption i.e $\frac{1}{2}$ (or) 3/4 nos.

b) 0.25 Mason — 2.83 cum
— 10 cum
⇒ $\frac{10 \times 0.25}{2.83}$ ⇒ 0.88 no
⇒ 0.9 nos.

(c) 3 Maz = 2.83 cum
= 10 cum
⇒ $\frac{10 \times 3}{2.83}$ ⇒ 10.6 nos = 11 nos.

(d) 2 Beld = 2.83 cum
= 10 cum
⇒ $\frac{10 \times 2}{2.83}$ ⇒ 7.0 no. = 3 nos

(e) 0.75 Bhist = 2.83 cum
= 10 cum
⇒ $\frac{10 \times 0.75}{2.83}$
⇒ 2.65 nos. = 3 nos

b) With from previous problem. Calculate rate analysis. with kankar lime (35% mortar) Take 10 cum.

S.No	Particulars	Quantity	Per	Rate	Amount
1)	Materials				
	Brick ballast I'class 40mm size	10 cum	Cum	650.00	6500.00
	kankar lime (35% = $\frac{35}{100}$ = 0.35 x10 = 3.5	3.5 cum	Cum	600.00	2100.00
					8600.00.
2)	Labours				
	Same as previous problem	—	—	—	10980.50
					19580.50
3)	Add 15% water charges = $\frac{1.5}{100}$ x 19580.50 = 293.7075				= 293.7075
4)	Add 10% contractors profit = $\frac{10}{100}$ x 19580.50				= 1958.05
					21832.55/-

Rate per cum = $\frac{21832.55}{10}$ = 2183.255/-

* Determine the rate analysis for Lime Concrete (L.C) in foundation (or) floor with 40mm size stone ballast, white lime and sand (Proportion 1:2:4) unit 1 cum. Take 10 cum.

Sol: Approximate Calculation of materials for 100 cum.

L.C mix proportion = 1:2:4.

Lime = $\frac{154}{1+2+4}$ = 22 cum

100 cum = 22 cum
10 cum = —? $\frac{10 \times 22}{100}$ = 2.2 cum.

Sand = $\frac{154}{7} \times 2$ = 44 cum,

Stone ballast = $\frac{154}{7} \times 4$ =) 88 cum.

S.No	Particulars	Quantity	Per	Rate	Amount ⑨
1)	Materials				
	Stone ballast	8.8 cum	cum	1800.00	15840.00
	Sand (or) bajri (local)	4.4 cum	cum	900.00	3960.00
	White lime slaked	2.2 cum	cum	800.00	1760.00
					21560.00
2)	Labours				
	Same from previous problem	—	—	—	10980.50
					32540.50
3)	Add 1.5% water charges $= \frac{1.5}{100} \times 32540.5 \Rightarrow 488.10$				488.00
4)	Add 10% Contractor's profit $= \frac{10}{100} \times 32540.50$				3254.05
					36282.55

Rate per cum. $= \frac{36282.55}{10} \Rightarrow$ 3628.255/-

* Determine the rate analysis for L.C in Terraced roof with 25mm size Brick ballast unit - 1 cum.

Take 10 cum.

a) With white lime and surkhi 1:2 (Proportion 18:36:100. i.e @1:2:5½ app.).

Sol:- Calculation of Materials

App. Take 100 cum. L.C.

100 cum = 18.1 cum

10 cum = 1.81 cum

Lime $= \frac{154}{1+2+5.5} = 18.1$ cum.

Surkhi $= \frac{154}{8.5} \times 2 = 36.2$ cum (3.62 cum)

Brick ballast $= \frac{154}{8.5} \times 5.5 \Rightarrow 99.6 = 100$ cum (10 cum)

S.NO	Particulars	Quantity	Per	Rate	Amount
1)	**Materials.**				
	Brick ballast 1 class 25mm gauge	10 cum	1 cum	700.00	7000.00
	Sand	1.81 cum	cum	800.00	1448.00
	white lime slaked				
	Sukchi	3.62 cum	cum	500.00	1810.00
2)	**Labours**				
	Same from previous problem	—	—	—	10.980.50
					21238.50
3)	Add 1.5% water charges $= \frac{1.5}{100} \times 21238.50 = 318.5$				319.00
4)	Add 10% contractors profit $= \frac{10}{100} \times 21238.5 =$				2123.85
					23681.35
	Lumpsum		=		18.65
					23700.00

Rate per Cum. $= \frac{23700}{10} = 2370.00/-$

NAC

1.

2. Teaching & learning — 350 marks.

Evaluation

7. Institutions & Verbal. beh
practices ⇒ A/S.S

Rajshakr.

3 Research & Invation - 100 marks. - Bheemlaal
& Extension.

4. Infrastructure & learning → Aruna & saisagar. — 100 marks

5.

6. leadership; Grivency — Anil & Ramana kumar sir.

Materials required for different Proportion of Cement concrete — 10 cum.

50 to 60 %.

Proportion	Ballast	Sand	Cement
1:1½:3 (54%)	8.40 cum	4.20 cum	2.80 cum (84 bags)
1:2:4 (54%)	8.80 cum	4.40 cum	2.20 cum (66 bags)
1:3:6 (50%)	9.00 cum	4.50 cum	1.50 cum (45 bags)
1:4:8 (50%)	9.20 cum	4.60 cum	1.15 cum (34½ bags)
1:5:10 (52%)	9.50 cum	4.75 cum	0.95 cum (28½ bags)
1:6:12 (52%)	9.60 cum	4.80 cum	0.80 cum (24 bags).

*) Determine rate analysis C.C (1:5:10) in foundation (or) floor with Brick ballast 40 mm (1½") thick gauge — Unit 1 cum. Take — 10 cum.

Sol:

S.No	Particulars	Quantity	Per	Rate	Amount
1)	Materials	$\frac{152\times10}{16}$ = 95 for 100 cum = 9.5 for 10 cum			
	a) Brick ballast 1st class 40 mm gauge	9.50	cum	650.00	6175.00
	b) Sand (local)	$\frac{152\times5}{16}$ = 47.5 cum for 100 cum = 4.75 for 10 cum; 4.75	cum	760	3610.00
	c) Cement (0.95 cum)	$\frac{152\times1}{16}$ = 9.5 for 100 cum = 0.95 for 10 cum; 28½ bags	bag	350.00	9975.00
					19760.00.
2)	Labours				
	Same as previous problem	—	—	—	10

2) Labours	½, ¾, 1			
a) Mistri	0.5 no.	Day	565	282.50
b) Mason	0.9 nos.	Day	470	423.00
c) Mazdoor	11 nos.	Day	425	4675.00
d) Beldar	7 nos.	Day	425	2975.00
e) Bhisti	3 nos.	Day	450.	1350.00
				9705.5
				19760.0
				29465.5
Lumpsum	Sundries			34.5
				29500.00
3) Add 1.5% q water charges $= \frac{1.5}{100} \times 29500$ $\Rightarrow 443.5 \Rightarrow 443$				443.00
				2950.00
4) Add 10% contractors profit $= \frac{10}{100} \times 29500$				32893.00

Rate per cumt $= \frac{32893}{10} = 3289.30/-$

Labours Calculation

b) Mason

0.25 Mason – 2.83 cum

– 10 cum

$= \frac{10 \times 0.25}{2.83}$

$\Rightarrow 0.883$

$\Rightarrow 0.9$ nos.

c) Bhisti

0.75 Bhi – 2.83 cum

– 10 cum

$\Rightarrow \frac{10 \times 0.75}{2.83}$

$\Rightarrow 2.65$ no.

$\Rightarrow 3$ nos.

c) Mazdoor

3 Maz – 2.83 cum

– 10 cum

$\frac{10 \times 3}{2.83} \Rightarrow 10.6$

$\Rightarrow 11$ nos.

d) Beldar

2 B – 2.83 cum $\Rightarrow \frac{10 \times 2}{2.83} \Rightarrow 7$ nos.

– 10 cum

* Determine the rate analysis for R.C.C work in beams, slabs etc 1:2:4 — unit 1 cum. Take 10 cum.

Sol:- Calculation of labours

a) Mistri (or) work inspection we are assuming as 0.5 nos.

b) Mason.

0.5 Mason — 2.83 cum
— 10 cum

$= \frac{10 \times 0.5}{2.83}$

$\Rightarrow 1.76$ nos.

$\Rightarrow 2$ nos.

c) Mazdoor

3 Maz — 2.83 cum
— 10 cum

$\Rightarrow \frac{10 \times 3}{2.83}$

$\Rightarrow 10.6$ nos.

$\Rightarrow 11$ nos.

d) Beldars

3 Beldars — 2.83 cum
— 10 cum

$\Rightarrow \frac{10 \times 3}{2.83}$

$\Rightarrow 10.6$

$\Rightarrow 11$ nos.

(e) Bhisti

1 1/3 B — 2.83 cum
1/3 = 0.33+1 — 10 cum

$\Rightarrow \frac{10 \times 1.33}{2.83}$

$\Rightarrow 4.69$ nos.

$= 5$ nos.

Density of steel = 7850 kg/m³ $\Rightarrow$ 78.5 q/m³ 1 quintal = 100 kgs
1 Tonne = 1000 kgs

steel, mild steel bars @ 1% = $\frac{1}{100} \times 10$ cum $\Rightarrow$ 0.1 cum.

1 cum = 78.5 q

0.1 cum = ?

$= \frac{0.1 \times 78.5}{1}$

$\Rightarrow 7.85$ q.

S.NO	Particulars	Quantity	Per	Rate	Amount
1)	Materials				
	a) Stone ballast 20 mm gauge	8.80 cum	cumt.	1800.00	15840.00
	b) Sand (Fine Coarse)	4.40 cum	cumt	1500.00	6600.00
	c) Cement (66 bags) 2.20 cum	66 bags 2.20 cum	bag	350.00	23100.00
	d) Steel				
	mild steel bars @1% =0.1 cumt. @ 78.5 q/cum = 7.85q	7.85 q	quintal	4400.00	34540.00
	e) Binding wire	1.5 kg	kg	65.00	97.50
					80177.50
2)	Labours				
	a) Mistri (Head Mason)	0.5 no.	Day	565.00	282.50
	b) Mason	2 nos.	Day	470.00	940.00
	c) Mazdoor	11 nos.	Day	425.00	4675.00
	d) Beldar	11 nos.	Day	425.00	4675.00
	e) Bhisti	5 nos.	Day	450.00	2250.00
					12822.50
	f) Lumpsum	Sundries		=	80177.50
					93000.00
3)	Bending, cranking, & binding steel bars in position				
	a) Blacksmith	8 nos.	Day	470.00	3760.00
	b) ~~Mazdoor~~ Beldar	8 nos	Day	425.00	3400.00
					7160.00

4) Centering & shuttering (both erection & dismantling)				
a) Timber planks & battles	Lumpsum	–	–	1500.00
b) Carpenter	10 nos.	Day	565.00	5650.00
c) ~~Mazdoor~~ Beldars.	10 nos	Day	425.00	4250.00
d) Nails	Lumpsum	–	–	200.00
				11600.00

Adding ① + ② + ③ + ④ ⇒ ~~80000~~ + 43000 + 7160 + 11600

⇒ 111760.00 ~~19439.50~~ 40.00 ~~6425~~

Lumpsum

~~19200.00~~ 111800.00

Total

Add 1½ % water charges = $\frac{1.5}{100} \times 111800$

⇒ ~~2580~~ 1677.00

Add 10% Contractor's profit = $\frac{10}{100} \times 111800$

⇒ 11180.00 ~~19200.00~~

124657.00 ~~25440.00~~

Rate per cumt = $\frac{124657.00}{10}$

⇒ 12465/- ~~25440.00~~

Brickwork with standared bricks.

Take a wall 1½ brick thick 30 cm nominal thickness of 20 mt length and 5 mt height. Nominal volume = 20 × 0.3 × 5 = 30 cumt.

Normally mortar joint will be less than 1cm, taking 1cm mortar joint, the actual thickness of wall be 29 cm.

Therefore, actual vol... = 20 × 0.29 × 5 = 29 cum.

No. of standard bricks @ 20 cm × 10 cm × 10 cm × nominal size

$$\text{No. of bricks} = \frac{\text{Actual volume}}{\text{nominal size}} = \frac{29}{0.2 \times 0.1 \times 0.1}$$

$$= 14500 \text{ bricks.}$$

∴ Therefore, no. of bricks per cum.(nominal) = $\frac{14500}{30}$

⇒ 484 nos. Considering 5% breakages, wastages, etc.

this may be taken 500 nos. per cum.

Cement mortar 3 cum dry mortar & lime mortar 3.5 cum dry mortar for taken 10 cum of Brick work

∴ 1 cum = 500 nos.

10 cum = 5000 nos.

Calculation of Materials of Mortar :-

Approximate method to determine the quantity of materials of mortar for 10 cu m baickwork - Divide 3 by the sum of the numerals of the proportion of materials which gives the quantity of cement in cu m. As for example for baickwork in 1:6 cement mortar cement = $\frac{3}{1+6}$ = 0.43 cu m... Therefore, Sand = .43 × 6 = 2.58 cu m. But as the cement will go to fill up the voids in sand, 45 cu m of cement & 2.7 cu m of sand may be taken.

Baickwork with Traditional Baicks 22.9 × 11.4 × 7.6 cm (9" × 4½" × 3")

Volume of one standard modular baick (nominal size) = 20 cm × 10 cm × 10 cm = 2000 cu m. Volume is almost same. Therefore the quantity of bricks and mortar as for standard baicks may be taken for baickwork with traditional baicks. Thus, the analysis of rate for baickwork with both types of baicks will be same.

For 25.4 cm × 12.7 cm × 7.6 cm (10" × 5" × 3") baicks 4200 baicks may be taken per cu m of baickworks, and Materials of mortar may be taken same as for standard baicks.

Materials and Labours required for Brickwork with different proportion of mortar for 10 cumt.

dry volume $\frac{3.5}{1+2} \times 1 = 1.166 = 1.2$ cumt
$\frac{3.5}{1+2} \times 2 = 2.33 = 2.4$ cumt

Materials	Proportion	Bricks	Lime	Sand (or) Surkhi (or) Cinder
a) White lime mortar	1:2	5000 nos	1.2 cumt	2.4 cumt
	1:3	5000 nos.	0.9 cumt	2.7 cumt
b) Kankar Lime Mortar	1	5000 nos.	3 cumt kankar lime	—
	1:1	5000 nos.	2.cumt K.L	2.cumt Sand
	Mud mortar	5000 nos.	3.5 cum earth	—

dry volume $\frac{3}{3} = 1$

c) Cement Mortar			Cement	Sand
	1:2	5000 nos	1.0 cumt (30 bags)	2.00 cumt
	1:3	5000 nos.	0.75 cumt ($22\frac{1}{2}$ bags)	2.25 cumt
	1:4	5000 nos.	0.6 cumt (18 bags)	2.4 cumt
	1:5	5000 nos.	0.5 cumt (15 bags)	2.5 cumt
	1:6	5000 nos.	0.45 cumt ($13\frac{1}{2}$ bags)	2.7 cumt

1 cum = 30 bags
0.75 cum =

Labour :- Labour may be taken same as respective Item as applicable.

Profit :- 10% Contractors profit may be added as usual.

If Cement is supplied by the department, 10% profit on the cost of cement should not be added but cost of transport from the godown to the site of work should be allowed and added.

1 *) I - class Brickwork in foundation and plinth with 20 x 10 x 10 cm (nominal size) Bricks with cement sand mortar 1:6 - unit 1 cum - Take 10 cum?

Sl.No	Particulars	Quantity	Per	Rate	Amount
a)	Materials				
a)	Brick I-class (500 bricks per cum)	5000 nos	1000 nos.	450.00	2250.00
b)	Cement (0.45 cum)	13.5 bags	bag	350.00	4725.00
c)	Sand [local]	2.7 cum	cum	760.00	2052.00
					29277.00
2)	Labours				
a)	Mistri	0.5 no	Day	565.00	282.50
b)	Mason	8 nos	Day	470.00	3760.00
c)	Mazdoor	16 nos.	Day	425.00	6800.00
d)	Beldar Bhisti	2 nos.	Day	450.00	900.00
					11742.50
					+29277.00
					41019.50
	Lumpsum	Sundries			= 30.50
					41050.00
3)	Add 1.5 %. water charges $= \frac{1.5}{100} \times 41050 \Rightarrow 615.75 \Rightarrow 620$				= 620.00
4)	Add 10 %. Contractors profit $= \frac{10}{100} \times 41050.00 \Rightarrow 4105$				= 45775.00

Rate per cum $= \frac{45775.00}{10} \Rightarrow 4577.50/-$

Labours Calculation :-

a) Mistri — 0.5 nos.

b) Mason —

$2\frac{1}{4}$ Mason — 2.83 cum
2.25

— 10 cum

$\Rightarrow \frac{10 \times 2.25}{2.83} \Rightarrow 7.95$ nos.

$\Rightarrow$ 8 nos.

Mazdoor

(c) 4.5 M — 2.83 cum
— 10 cum

$\Rightarrow \frac{4.5 \times 10}{2.83}$

$\Rightarrow 15.9$

$\Rightarrow$ 16 nos.

(d) Bhisti

0.5 B — 2.83 cum
— 10 cum

$\Rightarrow \frac{10 \times 0.5}{2.83}$

$\Rightarrow 1.76$

$\Rightarrow$ 2 nos.

*) Determine the rate analysis for I-class Brickwork in superstructure with 1:3 Lime surkhi mortar — Unit 1 cum. Take — 10 cum.

S.No	Particulars	Quantity	Per	Rate	Amount
1)	Materials				
	Brick Ist class	5000 nos.	1000 nos	4500.00	22500.00
	Lime	0.9 cum	cum	800.00	720.00
	Surkhi	2.7 cum	cum	500.00	1350.00
					24570.00
2)	Labours				
	Same as previous problem	—	—	—	11742.50
	Scaffolding Lumpsum	— Sundries	—	—	1000.00 37.50
					37350.00
3)	Add 1.5% water charges $= \frac{1.5}{100} \times 37350 \Rightarrow 560.25 \Rightarrow$				560.00
4)	Add 10% contractors profit $\Rightarrow \frac{10}{100} \times 37350 \Rightarrow 3735.00$				3735.00
	$\Rightarrow$ Rate per cum $= \frac{41645}{10} = 4164.5 \Rightarrow 4053.00$				41645.00

*) Half brick wall (10 cm partition wall) with 1:3 cement mortar. Unit 1 sq.mt. Take — 100 sq.mt. 100 sq.mt wall @ 10 cm thickness = 10 cum. $\left(\frac{10}{100} = 0.1 \times 100 = 10 \text{ cum}\right)$

Sl.No	Particulars	Quantity	Per	Rate	Amount
1)	**Materials**				
	a) Brick I-class	5000	½ nos	4500.00	22500.00
	b) Cement (0.75 cum)	22½ bags	bags	350.00	7875.00
	c) Sand (coarse)	2.25 cum	cum	1500.00	3375.00.
	d) Mild steel bars 6mm dia	40 kg	kg	45.00	1800.00
					35550.00
2)	**Labours**				
	a) Mistri	0.5 no.	Day	565.00	282.50
	b) Mason	8 nos	Day	470	3760.00
	c) Mazdoor	16 nos	Day	425	8800.00
	d) Bhisti	2 nos	Day	450	900.00
	e) Scaffolding	Lumpsum	–	–	1000.00
	Lumpsum	Sundries	–	–	207.5
					48500.00
3)	Add 1.5% water charges $= \frac{1.5}{100} \times 48500$ $\Rightarrow 727.5$				730.00
4)	Add 10% contractors profit $= \frac{10}{100} \times 48500$				4850.00
					54080.00

Rate per cum $= \frac{54080}{10}$

$\Rightarrow$ 5408.00/-

Random Rubble Stone Masonry in Superstructure with different mortar - Unit 1 cum. - Take 10 cum.

100 cum = 15 %
10 cum = 4.2 cum (42%)

Materials :- Stone - 12.5 cumt, Mortar (dry) - 4.2 cum (42%)

$\frac{42}{100} = 0.42 \times 10 = 4.2$

Mortar	Proportion	Cement	Sand
Cement, Sand & bajri mortar	1:3	1 cum (30 bags)	3.00 cumt
" " "	1:4	0.85 cum ($25\frac{1}{2}$ bags)	3.40 cumt
" " "	1:5	0.80 cum (24 bags)	4.00 cumt
" " "	1:6	0.70 cumt (21 bags)	4.20 cumt
Lime " (or) "	1:2	1.60 cumt lime	3.2 cumt
Lime " (or) "	1:3	1.2 cumt Lime	3.6 cumt

$\frac{4.2}{1+3} \times 1 = 1.05 = 1$ cum (sand)
$\frac{4.2}{4} \times 3 = 3.15$ cu $= 3$ cum
$\frac{4.2}{5} \times 1 = 0.84$ cum
$\frac{4.2}{5} \times 4 = 3.36$ cum $= 3.4$ cum

Q. Determine the rate analysis for random rubble stone masonry in superstructure in 1:6 Cement Sand mortar Unit 1 cumt - Take 10 cumt.

Sol:- Labour Calculation

a) Mistri - 0.5 no (assumption)

b) Mason
3 M - 2.83 cum
- 10 cum
$\Rightarrow \frac{10 \times 3}{2.83}$
$\Rightarrow 10.6$
$\Rightarrow 11$ nos.

(c) Beldars
3 B - 2.83 cum
- 10 cum
$\Rightarrow \frac{10 \times 3}{2.83}$
$\Rightarrow 10.6$
$\Rightarrow 11$ nos.

(d) Mazdoors
2 M - 2.83 cum
- 10 cum
$\Rightarrow \frac{10 \times 2}{2.83}$
$\Rightarrow 7$ nos.

e) Bhisthi
0.25 B - 2.83 cum
- 10 cum
$\Rightarrow \frac{0.25 \times 10}{2.83}$
$\Rightarrow 0.88 \Rightarrow 0.9$ nos.

*	SNO	Particulars	Quantity	Per	Rate	Amount
	1)	**Materials**				
		a) Stone including stone & wastage	12.5 cum	cum	1200.00	15000.00
		b) Cement (0.7 cum)	21 bags	bags	350.00	7350.00
		c) Sand (local)	4.2 cum	Cum	760.00	3192.00
						25542.00
	2)	**Labours**				
		a) Mistri	0.5 no.	Day	565.00	282.50
		b) Mason	11 nos	Day	470.00	5170.00
		c) Beldars	11 nos	Day	425.00	4675.00
		d) Mazdoor	7 nos	Day	425.00	2975.00
		e) Bhisti	0.9 nos.	Day	450.00	405.00
		f) Scaffolding	Lumpsum	–	–	1000.00
						14507.5
						+ 25542.00
						40049.5
		g) Lumpsum ~	Sundries			→ 50.5
						40100.00
	3)	Add 10% Contractors profit				→ 4010.00
						44110.00

$= \frac{10}{100} \times 40100 \Rightarrow 4010$

→ Rate per cum $= \frac{44110}{10} \Rightarrow$ 4411.00/-

Note:- Rate R.R.S.M in foundation & plinth – unit 1 cum. Take 10 cum

Materials :- Same as above

Labour :- Reduce 2 masons, 2 beldars 2 Mazdoor and remove scaffolding which is not required.

Coursed Rubble Stone Masonry in superstructure with different mortar - Unit 1 cum. Take 10 cum. (16)

Materials :- Stone - 12.5cum Mortar (dry) - 4.0 cum (40%)

$\frac{40}{100} \times 10$
$\Rightarrow 4.0$ cum

Mortar	Proportion	Cement	Sand
Cement Sand Mortar	1:3	0.95 cum (28½ bags)	2.85 cum.
" " "	1:4	0.8 cum (24 bags)	3.2 cum
" " "	1:5	0.7 cum (21 bags)	3.5 cum
" " "	1:6	0.6 cum (18 bags)	3.6 cum
		Lime	Surkhi / Sand
Lime, surkhi / Sand mortar	1:2	1.5 cum Lime	3.00 cum
" "	1:3	1.2 cum Lime	3.6 cum.

* Determine the rate analysis of coursed rubble stone masonry in superstructure in 1:6 cement sand mortar. Unit - 1 cum. Take - 10 cum.

S.No	Particulars	Quantity	Per	Rate	Amount
1)	Materials				
	a) Stone	12.5cum	cum	1200.00	15000
	b) Cement (0.6 cum)	18 bags	bag	350.00	6300
	c) Sand (local)	3.6cum	cum	760.00	2736
					24036.00
2)	Labours				
	Same as previous problem with scaffolding	—	—	—	14507.5
					38543.5
	Lumpsum	Sundries	—	—	- 56.5
					38600.00
3)	Add 10% contractor profit			=	3860.00
	Rate per cum = $\frac{42460}{10} \Rightarrow$ 4246.00				42460.00

Note:- C.R.S.M in foundation & plinth for 10 cum.

Materials :- Same as previous

Labour :- Reduce by 2 Masons, 2 B, 3 Mazdoor. and remove scaffolding which is not required.

* Ashlar stone Masonry with different mortar - Unit 1 cum.

Take 10 cum.

Materials :- Stone - 12.5 cum Mortar (dry) - 2.5 cum (25%)

$\frac{25}{100} \times 10$ cum

Mortar	Proportion	Cement	Sand
Cement sand mortar	1:3	0.6 cum (18 bags)	1.8 cum
" " "	1:4	0.5 cum (15 bags)	2.00 cum
" " "	1:5	0.4 cum (12 bags)	2.00 cum
" " "	1:6	0.35 cum ($10\frac{1}{2}$ bags)	2.10 cum
Lime sand mortar	1:2	1.00 cum Lime	2.0 cum

*) Determine the rate analysis for Ashlar masonry in superstructure in 1:6 Cement sand mortar - Unit 1 cum - Take 10 cum.

Sol:-

S.No	Particulars	Quantity	Per	Rate	Amount
a)	Materials				
	a) stone (undressed)	12.5 cum	cum	1000.00	12500.00
	b) Cement (0.35 cum)	$10\frac{1}{2}$ bags	bag	350.00	3675.00
	c) Sand (local)	2.10 cum	cum	760.00	1596.00
					17771.00
b)	Labour				
	Same as previous problem with scaffolding Lumpsum	—	—	—	14507.50
	Sundries	—	—	—	221.50
					32500.00
3)	Add 10% Contractors profit		=		3250.00
					35750.00

Rate per cum = $\frac{35750}{10} \Rightarrow$ 3575.00/-

Plastering

Materials for 12mm thick plastering in wall for 100 sq.m.

Wet mixed mortar for uniform layer = 1.2 cum.
Adding 30% to fill up joints, uneven surface etc. the quantity of mortar comes to $1.2 + 0.36\left(\frac{30}{100} \times 1.2\right) = 1.56$ cum.
Increasing by 25% the total dry volume = $1.56 + \frac{25}{100} \times 1.56 = 1.95$ cum $\Rightarrow$ 2 cum (say)
For 1:6 cement sand mortar. cement = $\frac{2}{1+6} = 0.285$ cum
$\Rightarrow 0.3$ cum, sand $= 0.3 \times 6 = 1.8$ cum. Similarly, the quantities of materials for other proportions may be calculated. The quantities of materials for different proportions are given below.

For 12 mm thick plastering, total dry volume 2 cum.

Mortar	Proportion	Cement	Sand
1) Cement mortar	1:2	0.60 cum (18 bags)	1.2 cum
2) Cement mortar	1:3	0.45 cum (13½ bags)	1.35 cum.
3) " "	1:4	0.40 cum (12 bags)	1.60 cum.
4) " "	1:5	0.35 cum (10½ bags)	1.75 cum
5) " "	1:6	0.30 cum (9 bags)	1.80 cum.
6) kankar lime	—	1.80 cum kankar lime	
7) White lime & Surkhi or) sand	1:1	1.0 cum white lime &	1.0 cum Surkhi or) sand.
8) White lime & Surkhi or) sand	1:2	0.70 cum white lime &	1.40 cum Surkhi/sand
9) Cement, white lime & sand	1:1:6	0.30 cum cement, 0.30 cum lime &	1.80 cum sand.

Materials for 20mm thick plastering in wall for 100 sqm.

As the thickness of plaster is more, 20% of mortar by may be taken to fill up the joints, unevenness. The quantity of wet mortar is equal to $100 \times 0.02 + 20\% \left(\frac{20}{100} \times 2\right)$
$= 2 + 0.4\left(\frac{20}{100} \times 2\right) = 2.4$ cum. Increasing 25% dry volume
$= 2.4 + 0.6\left(\frac{25}{100} \times 2.4\right) = 3.0$ cum. The q total dry volume 3.0 cum.

For 20mm plastering.

Mortar	Proportion	Cement $\frac{3}{1+2} = \frac{3}{3}$	Sand $\frac{3}{3} \times 2 = 2$
i) Cement mortar	1:2	1.0 cum (30 bags)	2.0 cum
ii) " "	1:3	0.75 cum (23.4 bags)	2.34 cum
iii) " "	1:4	0.65 cum (19½ bags)	2.6 cum
iv) " "	1:5	0.54 cum (16.2 bags)	2.70 cum
v) " "	1:6	0.46 cum (13.8 bags)	2.76 cum.

Rich mortar :- For rich mortar plastering, quantities of materials will be less as cement will be in excess than the voids in sand and the reduction in volume of dry mortar will be less.

Ceiling plastering 12 mm thick for 100 sqm :- For plastering in R.C.C Ceiling the unevenness surfaces will be less & 20% extra mortar may be taken to get even surface. The quantity of wet mortar is equal to $100 \times 0.012 + 20\% \Rightarrow 1.2 + 0.24\left(\frac{20}{100} \times 1.2\right) = 1.44$ cum.
Increasing by 25% dry volume $= 1.44 + 0.36\left(\frac{25}{100} \times 1.44\right) = 1.80$ cum.

For 6mm thick plastering R.C.C ceiling the dry quantity of dry mortar may be taken as 1.00 cum.

For plastering in floor over lime concrete the same quantity of mortar as for wall may be taken there will be sufficient unevenness in the surface of lime concrete.

Neat Cement floor:- For neat cement finishing in floor (or) dado (or) skirting, the thickness of neat cement layer may be taken as 1.5mm ($\frac{1}{6}$") thick,

Therefore, Cement paste requirement for 100 sqm = 100 x 0.0015 = 0.15 cum. Dry volume of cement increased by 25%

$= 0.15 + 0.15 \times \frac{25}{100} = 0.19$ cum, $\Rightarrow$ 2.0 cum = 6 bags per 100 sq.mt.

* Determine the rate analysis for 12 mm thick plastering 1:6 unit 1 sq.mt - Take 100 sq.mt.

12mm - 2cm
$\frac{2}{12} \times 1 = ?$

Labour calculations :-

a) Mistri — 0.5 no. (assumption)

b) Mason

3 M — 40 sq.mt
— 100 sq.mt
$\Rightarrow \frac{100 \times 3}{40}$
$\Rightarrow$ 7.5 nos.
$\Rightarrow$ 8 nos

c) 3 Maz — 40 sq.mt
— 100 sq.mt
$\Rightarrow \frac{10 \times 3}{40}$
$\Rightarrow$ 7.5
$\Rightarrow$ 8 nos

d) Bhisti — 40 sq.mt
— 100 sq.mt
$\Rightarrow \frac{100 \times 1}{40}$
$\Rightarrow$ 2.5 nos
= 3 nos

S.No	Description of Item	Quantity	Per	Rate	Amount.
1)	Materials				
	a) Cement (0.30cum)	9 bags	bag	350.00	3150.00
	b) Sand (local)	1.8 cum	cum	760.00	1368.00
					4518.00
2)	Labours				
	a) Mistri	0.5 nos	Day	565.00	282.5
	b) Mason	8 nos	Day	470.00	3760.00
	c) Mazdoor	8 nos	Day	425.00	3400.00
	d) Bhisti	3 nos	Day	450.	1350.00
	e) Scaffolding Lumpsum	Lumpsum	—	—	~~800.00~~
		Sundries	—	—	89.50
					14200.00

9592.5
14410.5

3) Add 1.5% water charges = 14200.00

$\frac{1.5}{100} * 14200 = 213$ — 213.00

4) Add 10% contractor's profit = 1420.00

15833.00

∴ Rate per sq.mt = $\frac{15833}{100}$

= 1583.30/-

= 158.00/-

② Determine the rate analysis for 6mm thick cement 1:3 in R.C.C ceiling — Unit 1 sqmt — Take 100 sqmt.

Dry volume of materials of mortar = 1.00 cumt.

S.NO	Particulars	Quantity	Per	Rate	Amount
1)	Materials				
	a) Cement (0.25 cumt)	$\frac{1}{1+3} = 0.25$ 7.5 bags @ 25 cum	bag	350.00	2625.00
	b) Sand (local)	$\frac{1}{1+3} \times 3 = 0.75$ cum	cumt	760.00	570.00
					3195.00
2)	Labours				
	Same as previous problem with scaffolding	—	—	—	8792.5
	Lumpsum	Sundries	—	—	812.5
					12000.00
3)	Add 1.5% water charges = $\frac{1.5}{100} \times 12000$ =)				180.00
4)	Add 10% contractor's profit = $\frac{10}{100} \times 12000.00$			=	1200.00
					13380.00

Rate per sq.mt = $\frac{13380}{100}$

=) 133.80/-

=) 134.00/-

Pointing

For pointing in brick work total dry volume of materials is taken as 0.6 cumt for 100 sq.mt.

Materials required for pointing with different mortars of various proportions for 100 sq.mt $\frac{0.6}{1+2} = 0.2$, $\frac{0.6}{3} \times 2 = 0.4$

Mortar	Proportion	Cement	Sand
Cement mortar	1:2	0.2 cum (6 bags)	0.4 cum
" "	1:3	0.16 cum (4.8 bags)	0.48 cum.
White lime & Surkhi mortar	1:1	lime slaked 0.32 cum	Surkhi 0.32 cum
Kankar lime mortar alone	—	0.5 cum. kankar lime	—

For all types of pointing quantity of materials may be taken same as above, except raised pointing where quantity may be increased by 10%.

* Determine rate analysis for cement pointing 1:2 — unit 1 sq.mt

Take 100 sq.mt.

S.NO	Particulars	Quantity	Per	Rate	Amount
1)	Materials				
	a) Cement (0.2 cumt)	6 bags	bag	350	2100.00
	b) Sand (local)	0.40 cum	cum	760	304.00
					2404.00
2)	Labours				
	Same as plastering labour with Scaffolding Lumpsum	—	—	—	9592.5, 11996.5 / 3.5 = 12000.00
					150.00
3)	Add @ 1.5% water charges $= \frac{1.5}{100} \times 12000 \Rightarrow 180$				1200.00
4)	Add 10% contractors profit $\Rightarrow \frac{10}{100} \times 12000$				13380.00

Rate per sq.mt $= \frac{13380}{100} \Rightarrow 133.00$ /-

Cement Concrete Floor :-

The quantity of cement concrete may be calculated by multiplying the area of floor by the thickness, and the quantity of each material may be found on the same principle as for cement concrete

For 2.5cm C.C floor for 100 sq.m of area the quantity of cement concrete = $100 \times 0.025 \Rightarrow 2.5$ cum. Adding 10% extra for unevenness of base concrete, the quantity comes to $2.5 + 0.25 = 2.75$ cum.

For 100 cum cement concrete the total dry volume of materials is 125. i.e approximately 50% more.

For 2.5cm thick C.C floor of 1:2:4 proportion, for 100 sq.m total dry volume of materials $= 2.75 + 50\%$ $= 2.75 + 1.375 \Rightarrow 4.125$ cum. Therefore, cement $= \frac{4.125}{1+2+4} = 0.59$ cum $\Rightarrow 0.6$ cum (18 bags), Sand $= 0.6 \times 2 = 1.20$ cum, and stone aggregate $= 0.6 \times 4 = 2.4$ cum. For neat cement surface cement finishing add extra cement of 0.2 cum (6 bags).

For 4cm thick C.C 1:2:4 floor 100 sq.m total dry volume of concrete $= 100 \times 0.04 + 10\%$ (for unevenness) $+ 50\%$ increase for dry volume $= 4.4 + 2.2 = 6.6$ cum. Therefore, cement $= \frac{6.6}{1+2+4}$ $= 0.94$ cum (28.2 bags), Sand $= 0.94 \times 2 = 1.88$ cum and Stone aggregate $= 0.94 \times 4 = 3.76$ cum. For neat cement finishing and extra cement of 0.2 cum (6 bags).

For coloured cement floor, mix pigment colour with neat surface cement in the proportion of 1:3 to 1:6 (colour : cement) to have the desired colour. White cement

mixed with colour pigment of the desired proportion may be also be used, but for strength it is better if ordinary portland cement is mixed with white cement in the proportion of 1:1 to 1:3 (grey portland cement; white cement) and then to add colour pigment to have the desired colour.

When colour pigment is mixed with white cement, the requirement of colour pigment is much less, may be 1:5 to 1:10 (pigment : white cement).

Determine the rate analysis of 2.5 cm cement concrete floor 1:2:4 unit 1 sq.mt. Take 100 sq.mt

Sol:- Labours Calculation :-

a) Mistri — 0.5 nos.

b) 5 Masons — 40 Sq.mt
— 100 Sq.mt

$\Rightarrow \frac{100 \times 5}{40}$ $\Rightarrow$ 12.5.

$\Rightarrow$ 13 nos.

c) 1 Bhisti — 40 Sq.mt
— 100 Sq.mt

$\Rightarrow \frac{100 \times 1}{40}$

$\Rightarrow$ 2.5 nos.

(c) 4 Beldars — 40 Sq.mt
— 100 Sq.mt

$\Rightarrow \frac{100 \times 4}{40}$

$\Rightarrow$ 10 nos.

(d) 3 Mat — 40 Sq.mt
— 100 Sq.mt

$\Rightarrow \frac{3 \times 100}{40}$

$\Rightarrow$ 7.5 no

$\Rightarrow$ 8 nos.

S.No	Particulars	Quantity	Per	Rate	Amount
1)	**Materials**				
	a) Stone ballast 20 mm	2.4	cum	1800.00	4320.00
	b) Sand (coarse)	1.2	cum	1500.00	1800.00
	c) Cement - (0.6 cum / 16 bags)	16 bags	bag	350.00	6300.00
	d) Cement - for surface finishing (0.2 cum / 6 bags)	6 bags (0.2 cum)	bag (cum)	350.00	2100.00
					14520.00
2)	**Labours**				
	a) Mistri	0.5 nos	Day	365.00	252.5
	b) Mason	13 nos	Day	470.00	6110.00
	c) Beldars	10 nos	Day	425.00	4250.00
	d) Mazdoor	8 nos.	Day	425.00	3400.00
	e) Bhisti	3 nos	Day	450.00	1350.00
	f) Side-forms	1 lumpsum	-	-	500.00
					15892.5
	8) Lumpsum	Sundries		+	14520.00
					87.5
					30500.00
	h) Add 1.5% water charges				460.00
	$= \frac{1.5}{100} \times 30500 \Rightarrow 457.5$				
	i) Add 10% Contractors profit			=	3052.00
					34010.00

$\therefore$ Rate per sq.m $= \frac{34010}{100}$

$\Rightarrow$ 340.10/-