Q.1 (b) What do you understand by the terms 'initial setting time' and 'final setting time'? How do you determine them in the laboratory? 10

Ans

I. Initial setting time

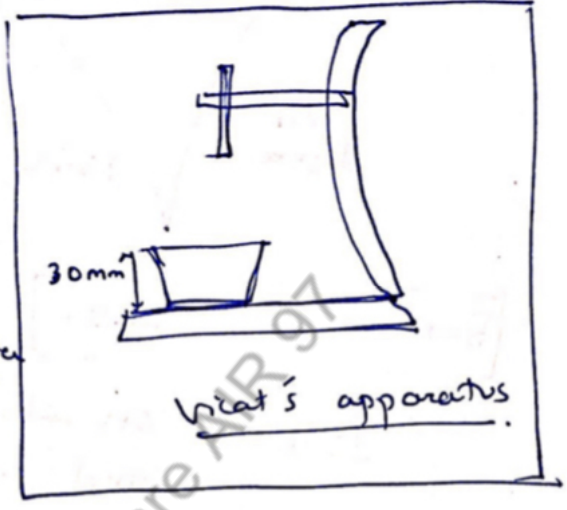
It is the time elapsed after mixing of water when the cement starts to set or harden.

As per Vicats experiment, it is time required when the square needle is not able to penetrate 5-7mm from bottom of mould

II. Final setting time

It is the time elapsed after mixing of water when cement has hardened or set

As per Vicat's experiment, it is time required when collar is not able to penetrate or leave a mark but small needle in middle leaves a small mark.



Vicat's apparatus.

Method

* 100gm of cement is taken
* water is mixed (usually 0.85x water of consistency) ie, (0.85P)
* It is filled in mould
* Non perious base is used
* surface is made smooth
* Time (t_1) is noted when water was added → of 1mm
* Square needle is lowered → (t_2) is noted when, not able to penetrate below 5-7mm from bottom. This is initial setting time.
* Let some time pass
* Then plunger of 10mm is lowered → (t_3) is noted when not able to leave a mark (not able to penetrate) This is final setting time.

Q.8 (c) (i) Explain any five important characteristics of contours with neat sketches.

(ii) The staff readings taken during a levelling operation are given below:
1.355, 1.605, 2.125, 0.685, 1.365, 2.015, 1.355, –1.385, 0.685, 2.105, 1.685, 1.155, 1.105, 2.015, 1.085, 1.345, 1.355, –2.015, 1.305, 1.655, 1.685, 1.455.
The instrument was shifted after the 5th, 10th, 14th and 19th readings. Arrange the data in tabular form and find the reduced levels of the points if the 12th reading was taken to a benchmark of RL 185.635 m. (Use height of collimation method)

6 + 14 = 20

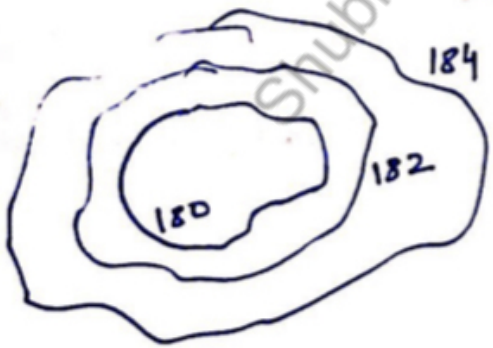
A

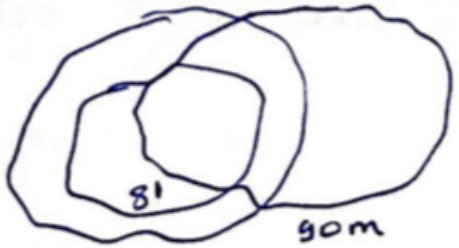
Contour is the line joining the point of same elevation

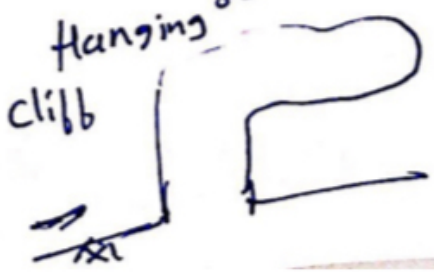
Imp. characteristics

→ Two contour never cross each other

→ Except in case of cliff and valley

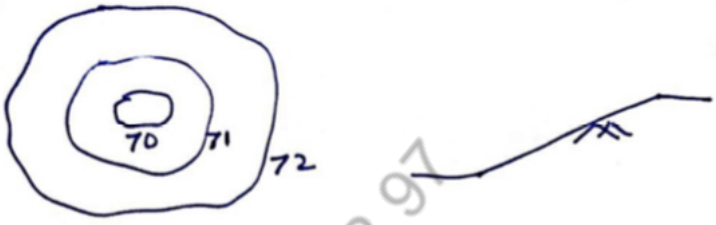






↳ Closely spaced contour notify that there is steep slope

↳ Distantly spaced contour notify small slope



↳ They are important for finding
- ↳ Excavation work
- ↳ Right alignment of for road
- ↳ Dam site selection
- ↳ Understanding topography for water conservation

↳ Lake/water body has no only one contour.

Given

$(RL)_{benchmark} = 186.635\ m$

Use ht of collimation.

thus finding ⓒ collimation level of all and RL.

No.	BS	IS.	FS	Fall in collimation	Rise in collimation	Collimation level	R.L
1	1.355					187.24	186.155
2		1.605		0.25		186.99	185.905
3		2.125		0.52		186.47	185.385
4		0.685			1.44	187.91	186.825
5	2.015	#	1.365	0.68		187.23	186.145
6		1.355			0.66	187.89	186.805
7		-1.385			2.75	190.64	189.555
8		0.685		2.07 (+)	(-)	~~189.22~~ 188.57	187.485
9	1.685		2.105	1.42		187.15	186.065
10		1.155			0.53	187.68	186.595
11		1.105		0.05		187.63	186.545
12	1.085		2.015	0.91		186.72	185.635
13		1.345		0.26 (-)	(+)	186.46	185.375
14		1.355		0.01		186.45	185.365
15		-2.015			3.37	189.82	188.735
16	1.655		1.305	3.32		186.5	185.415
17		1.685		0.03		~~186.47~~	~~185.385~~
18			1.455		0.23	186.7	185.615
	Σ7.795		Σ8.245	Σ952		Diff = 0.54	Diff = 0.54

Hence checking

~~ΣBS = Σ~~ ΣFS - ΣBS ~~≠8.245 - 7.795~~

= Fall - rise

= 1st RL - Last RL.

Q.4 (a) A Tacheometer was setup at station P and observations were made at two stations Q and R. The vertical angles to Q and R were 5°30′ and 1° 08′ respectively. The cross-hair readings at Q were 2.105, 2.47 and 2.835 m and those at R were 2.215, 2.56 and 2.905 m. The staff was held vertical in both the cases. The instrument constants were 100 and 0.3. The reading from P to a BM of RL 285.35 m was 2.255 m. The horizontal angle QPR measured was 58°30′. Find the distance QR and the gradient from Q to R.

15

Ans

Given:

K = 100

C = 0.3

Find

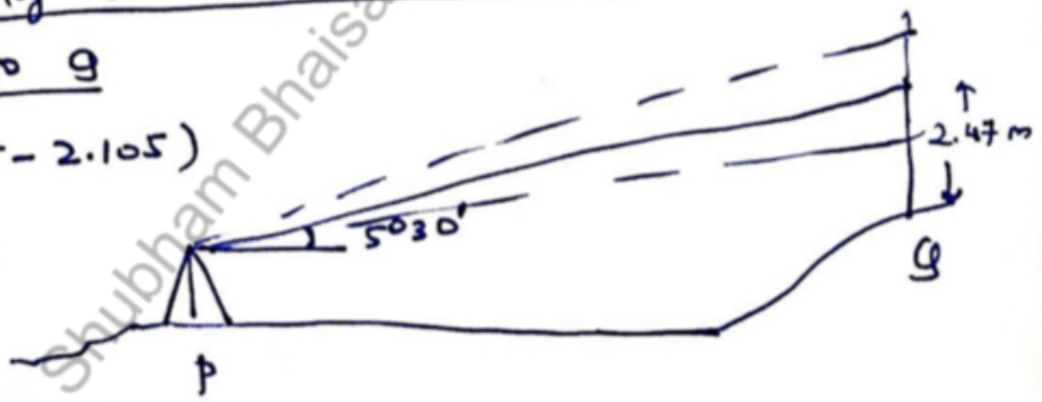
* QR
* Gradient

I> Finding horizontal distance

P to Q

S = (2.835 − 2.105)

= 0.73



∴ $D = KS\cos^2\theta + C\cos\theta$

$= 100 \times 0.73 \times \cos^2(5°30') + 0.3 \times \cos(5°30')$

$D_{P-Q} = 72.62$ m

and $V = D\tan\theta = 72.62 \times \tan 5°30'$

$= 7$ m

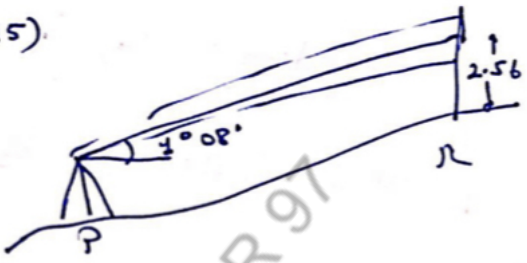
Hence $(R.L)_Q = (285.35 + 2.255 + 7) - 2.47$

$\boxed{RL_Q = 292.135\,m}$

II. Finding horizontal distance of P–R and $(R.L.)_R$

$\therefore S = (2.905 - 2.215)$

$= 0.69\,m$



$\therefore D = 100 \times 0.69 \times \cos^2(1°08') + 0.3\cos(1°08')$

$\boxed{D_{PR} = 69.27\,m}$

and $V = D\tan\theta$

$= 69.27 \tan(1°08')$

$= 1.37\,m$

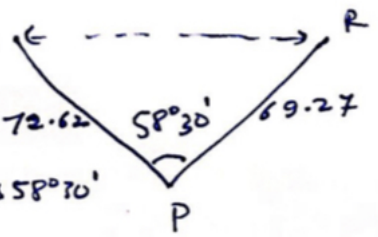
$\therefore (RL.)_R = (285.35 + 2.255 + 1.37) - 2.56$

$\boxed{RL_R = 286.415\,m}$

III. Finding distance QR

$\therefore QR = \sqrt{PQ^2 + PR^2 - 2PQ.PR\cos\theta}$

$= \sqrt{72.62^2 + 69.27^2 - 2\times 72.62 \times 69.27\cos 58°30'}$



$\boxed{QR = 69.39\,m}$ .... Ans.

Q.4 (b)

$$\text{Gradient} = \frac{\text{vertical distance}}{\text{Horizontal}} = \text{slope}$$

$$= \frac{292.135 - 286.415}{69.39}$$

$$= 0.0824$$

[Gradient is, 1 in 12.13 .. Ans

and Distance QR = 69.39 m]