CE 103: Surveying

Lecture 17: Tachometry (Contd.)

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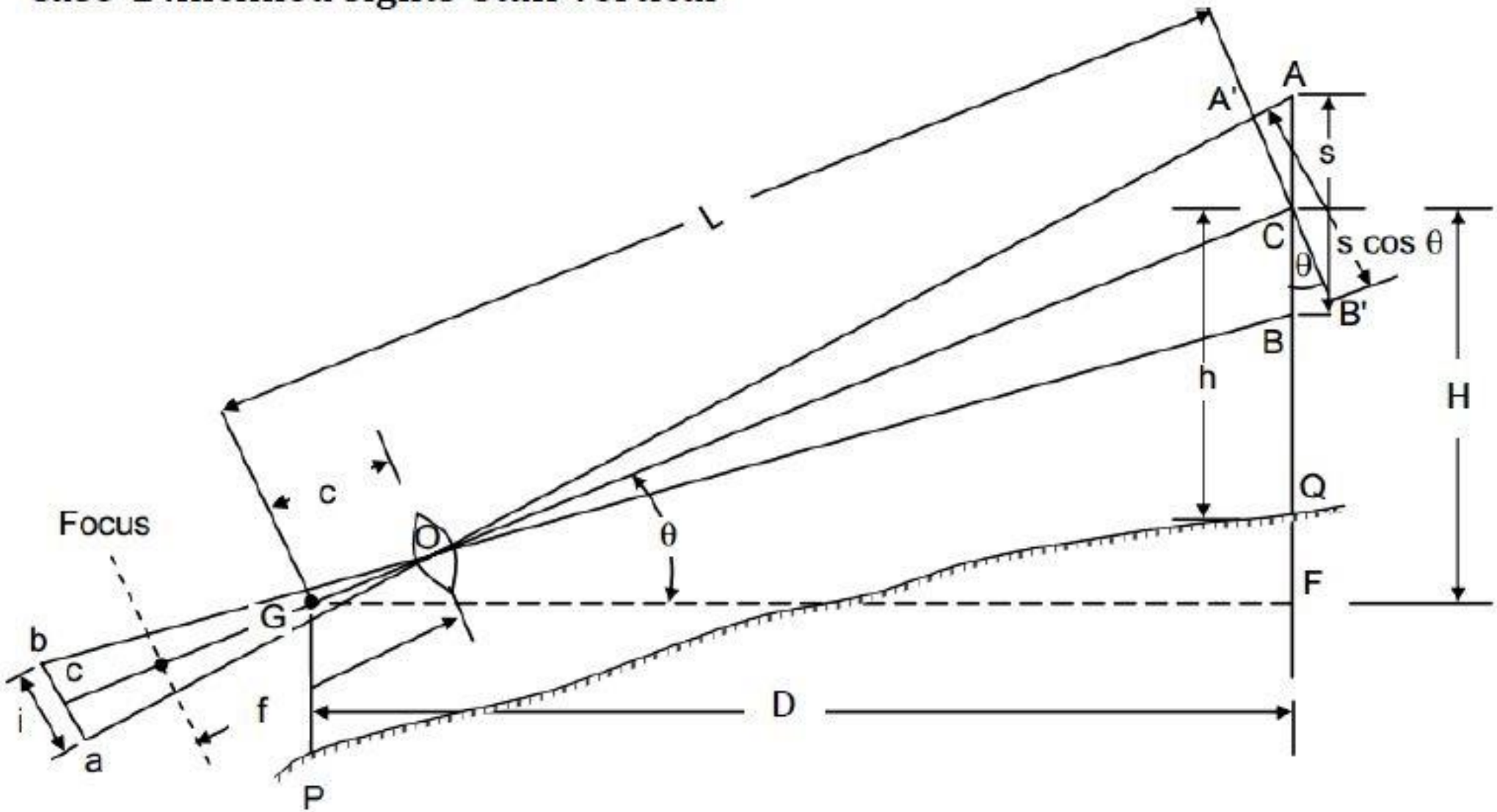
Outline

- ❑Inclined sights- staff vertical
- ❑Inclined sights –staff is normal to sight
- ❑Math problem on missing stadia reading

Case-1 :Inclined sights-Staff Vertical

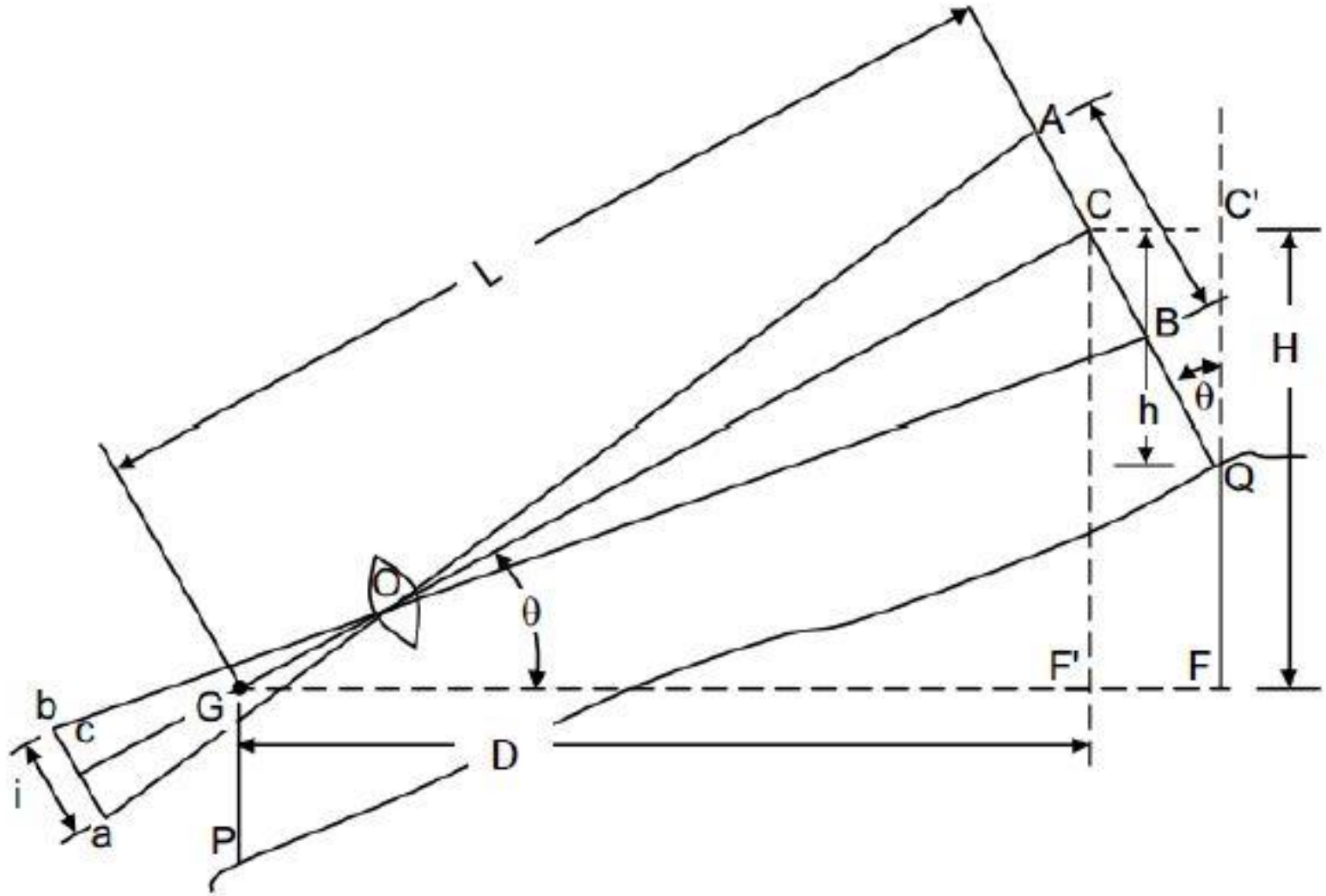


$$H = ks\frac{\sin 2\theta}{2} + C\sin\theta$$

$$D = ks\cos^2\theta + C\cos\theta$$

The elevation of Q = R.L. of instrument centre +H-h

Case-2 :Inclined sights-Staff is normal to sight



$$H = ks\sin\theta + C\sin\theta$$

$$D = ks\cos\theta + C\cos\theta + h\sin\theta$$

The elevation of Q = R.L. of instrument centre +H-hcosθ

- A tacheometer was set up at A. The following observations were made on a vertically held staff:

Instrument Station	Staff Point	Whole Circle Bearing	Vertical Angle, Θ	Reading		
A	P(R.L. =22.104 ft)	15°30'	0	2.52	3.16	3.80
A	Q (R.L. = 31 ft)	60°15'	+2 °21'	2.07	3.15	4.23
A	R (R.L. =1.204 ft)	240°15'	-2°30'	?	2.82	?

AP = 129 ft.(horizontal distance)
Determine the following:

1.Tacheometric constants.
2.Missing Stadia Readings.

Solution

$AP = 129' = K(3.8 - 2.52) + C$

$\Rightarrow 129 = 1.28K + C \quad \ldots(i)$

R.L. of instrument centre = 22.104 + 3.16

= 25.264 ft

R.L. of Q = R.L. of instrument centre $+ H_{AQ} - h$

$\Rightarrow 31 = 25.264 + H_{AQ} - 3.15$

$\therefore H_{AQ} = 31 - 25.264 + 3.15 = 8.886$ ft

$\therefore 8.886 = K_s \frac{\sin 2\theta}{2} + c \sin\theta$

$= k(4.23 - 2.07) \frac{\sin 4°42'}{2} + c \sin 2°21'$

$= 0.0885k + 0.041c$

$\therefore 8.886 = 0.0885k + 0.041c \quad \ldots (ii)$

solving (i) & (ii),

$$k = 99.86 \approx 100$$

$$c = 1.18$$

Again,

R.L. of R = R.L. of instrument centre + H_{AR} -h

$\Rightarrow$1.204 = 22.104 + H_{AR} - 2.82

$\Rightarrow H_{AR}$ = -18.08

Now,

$$H_{AR} = \frac{ks\sin 2\theta}{2} + C\sin\theta = \frac{100s\sin(-5^0)}{2} + 1.18\sin(-2.5^0) = -4.36s - 0.0515$$

Now,

H_{AR} = -4.36s-0.0515 = -18.08

$\Rightarrow$s = 4.13

Lower stadia reading = 2.82- (4.13/2) = 0.755

Upper stadia reading = 2.82 + (4.13/2) = 4.885