CVG 2171 (Surveying and Measurements)-Solutions

Mid-Term Exam (March 8th, 2017)

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1. Corrections must be made for pull, Temperature & Sag.

- Correction for pull:

$$C_p = (P_1 - P)\frac{L}{AE} = (20-12)\times\frac{688.32}{0.006\times 29\times 10^6} = 0.03\ ft$$

- Correction for temperature:

$$C_t = k(T_1 - T)L = 0.0000065(88-68)\times 688.32 = 0.09\ ft$$

- Correction for Sag:

$$C_s = -\frac{w^2 L_s^3}{24 P_1^2} \quad ; \quad w = \frac{2}{100} = 0.02\ lb/ft$$

$$C_{s_1} = -\frac{(0.02)\times(100)^3}{24\times(20)^2}\times 6 = -0.25\ ft$$

$$C_{s_2} = -\frac{(0.02)^2\times(88.32)^3}{24\times(20)^2} = -0.03\ ft$$

$\therefore C_s = -0.25 - 0.03 = -0.28\ ft.$

Correct Distance Measured:

$$688.32 + 0.03 + 0.09 - 0.28 = \underline{\underline{688.16\ ft}}$$ ANS.

2.

Station	BS (m)	HI (m)	FS (m)	Elevation (m)
BM 77	2.720			131.275
TP 1	0.503	133.995	2.892	131.103
TP 2	0.212	131.606	3.056	128.550
BM 78	1.246	129.762	3.302	125.460
TP 3	2.169	126.706	1.257	125.449
TP 4	2.695	127.618	0.678	126.940
BM 79		129.635	0.202	129.433 ✓

CHECK: $\Sigma BS = 9.545$, $\Sigma FS = 11.387$

∴ Elevation of BM 79 : $131.275 + (9.545 - 11.387) = 129.433$ m.

checks. ✓

3.

Course	Length (m)	Azimuth	Departure (m)	Latitude (m)
AB	309.72	86° 41′	309.20	17.92
BC	201.44	89° 33′	201.43	1.58
CD	235.70	204° 24′	−97.37	−214.65
DE				
EA	359.10	316° 32′	−247.04	260.63

Σ Departure = 166.22 m.

$\therefore$ Departure of DE = $\underline{-166.22\text{m}}$

Σ Latitude = 65.48 m.

$\therefore$ Latitude of DE = $\underline{-65.48\text{m}}$.

$$\text{Length of DE} = \sqrt{(-166.22)^2 + (-65.48)^2} = \underline{178.65\text{m}}. \quad \text{ANS.}$$

$$\text{Azimuth of DE} = \tan^{-1}\frac{\text{Dep.}}{\text{Lat.}} = \tan^{-1}\frac{-166.22}{-65.48} = 248.4987^\circ$$

$$= \underline{248^\circ 30'} \quad \text{ANS.}$$