Baghdad University
Engineering College
Civil Department

06-17-2013
Time:3 Hours
Final exam
2nd Class

Engineering Surveying

Answer five questions including question six

Q:1 In a series leveling for the center line of a road under construction the staves readings were as follows:
0.95 -2.05 -1.50 -2.10 -2.65 -1.35 -2.10 -0.55 -1.40 -1.10
If the grade of the last point was(402.5m) and the height of the fill in this point was(1.25m), the slope of the road between points (1 to3) was (-1.2%) and between points(3 to 6)was(0.0%) and between(6 to 8) was (6.7%) calculate the depth of cut and the height of fill in each point ,if the distances between points were (0- 26 -41.6 -53 -84 -98 -108 -140) respectively.
The underlined values represent turning points.

Q:2 A steel tape has the following specifications: Mass=0.5kg, $A=2mm^2$,$E=20\times10^{10}$ N/m , (L at 20 C^0 and 50 N tension=30.005m) ,$\alpha=11\times10^{-6}$ / C^o ,IF$\Delta T=15.2$ C^0 and P=100N in the site which was with a slope (0.06%) and 500m above M.S.L. calculate the corrections for one time measurement with this tape.(R=6370km).

Q:3 In a 300m radius horizontal circular simple curve the coordinates of the P.C. are(2014.257mE,1542.168mN) and the coordinates of the P.I. are (2115.372mE,1593.188mN),P.C.=1109.27m,calculate the components of this curve L_M_E_P.T._P.I. and C).

Solution Q: 1 First group

Pt.	elev.	Grade	cut	fill
1	400	400.185		0.185
2	398.9	399.873		0.973
3	399.45	399.686		0.236
4	398.8	399.686		0.836
5	400.15	399.686	0.464	
6	399.4	399.686		0.286
7	400.95	400.356	0.594	
8	401.25	402.5		1.25

Solution Q:2

- $C_5 = 30.005 - 30$

$= 0.0005\,m$

-- $C_T = 30 \times 11 \times 10^{-6} \times 15.2^{\circ}$

$= 0.00546\,m$

3- $C_P = \dfrac{30 \times (100 - 50)}{2 \times \dfrac{20 \times 10^{6}}{10^{6}}}$

$= \dfrac{30 \times 50}{40 \times 10^{4}}$

4- $C_S = 0.00375\,m$

5- $C_S = 1 \times \dfrac{30(0.5 \times 10)^2}{24(100)^2}$

6- $C_{slope} = \dfrac{\left(\frac{0.06 \times 30}{100}\right)^2}{2 \times 30}$

7- $C_{M.S.L.} = \dfrac{30 \times 500}{(6770 \times 1000) + 500}$

Solution : Q:3

$x_2 - x_1 = 2115.372 - 2014.257$

$= 101.118\,m$

$y_2 - y_1 = 1593.188 - 1542.168$

$= 51.02\,m$

$$T = \sqrt{(101.118)^2 + (51.02)^2}$$

$= 113.266\,m$

$$T = r \tan \frac{\Delta}{2}$$

$$113.266 = 300 \tan \frac{\Delta}{2}$$

$$\tan \frac{\Delta}{2} = \frac{113.266}{300}$$

$= 0.3775533$

$\frac{\Delta}{2} = 20.684196$

$\Delta = 41.368392$

$$M = r\left(1 - \cos \frac{\Delta}{2}\right)$$

$= 300(1 - \cos 20.684196)$

$$E = r\left(\sec \frac{\Delta}{2} - 1\right)$$

$E = 300(\sec 20.684196 - 1)$

$$L = \frac{41.368392 \times 300}{57.2958}$$

$= 216.604\,m$

$$C = 2r \sin \frac{\Delta}{2}$$

$= 2 \times 300 \sin 20.684196$

$P.I. = 1109.27 + 113.266$

$= 1222.536\,m$

$P.T. = P.I. + T$

$= 1335.802$

Pt4

$$V_P = \frac{d}{3}\left[(A_1 + A_n) + 4E + 2O\right]$$

$$= \frac{2}{3}\left[(476000 + 1000) + 4(431000 + 296000 + 164000 + 10000) + 2(377000 + 219000 + 84000)\right]$$

$$= \frac{2}{3}\left[477 + 4(901) + 2(680)\right]$$

$$= \frac{2}{3}\left[477 + 3604 + 1360\right]$$

$$= \frac{2}{3}\left[5441\right]$$

$$= 10882000\ m^3$$

$$V = \frac{A_1 + A_2}{2} \times (X)$$

$$1800000 = \frac{476000 + 1000}{2} \times (X)$$

$$1800000 = \frac{477000}{2} \times (X)$$

$$X = 7.547\ m \simeq 7.550$$

$$Elev._{Top} = 142 + 7.5$$

$$= 149.5\ m \simeq 150\ m$$

Solution Q:5

Bearing $AB = N60^\circ E$

$BC = 180^\circ - 115^\circ$

$= S65^\circ E$

Bearing $DA = 360^\circ - 310^\circ$

$= N50^\circ W$

$\rightarrow \Delta y_{AB} = 550 \cos 60^\circ \rightarrow 550 \times 0.5$

$= 275.000$

$\Delta x_{AB} = 550 \sin 60^\circ$

$= 476.314$

$\Rightarrow \Delta y_{BC} = 1200 \cos 65^\circ$

$= -507.142$

$\Delta x_{BC} = 1087.570$

$\rightarrow \Delta y_{DA} = 674.927$

$\Delta x_{DA} = -804.347$

$\Sigma \Delta y = 0$

$\Sigma \Delta x = 0$

$\Sigma \Delta y = 275.000 - 507.142 + 674.927 + l\cos\theta$

$\Sigma \Delta x = 476.314 + 1087.570 - 804.347 + l\sin\theta$

$\Sigma \Delta y = 442.785 + l\cos\theta$

$\Sigma \Delta x = 759.661 + l\sin\theta$

$\frac{l\sin\theta}{l\cos\theta} = \frac{-759.661}{-442.785}$

$\tan\theta = 1.7176097$

$\theta = 59^\circ\ 47'\ 30''$

Bearing $CD = S59^\circ\ 47'\ 30''W$

$l\sin\theta = 759.661$

$L = \frac{759.661}{0.8859694} \rightarrow L = 857.030\ m$