

NAME _____ Score _____

CEEN 113-1 Engineering Measurements
Open Book, Closed Note, Calculator Required

Final Exam

Fall 1996

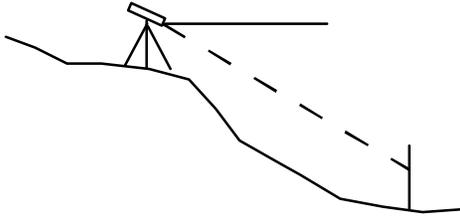
INSTRUCTIONS

3 hour time limit, 1 point penalty for every two minutes over the time.

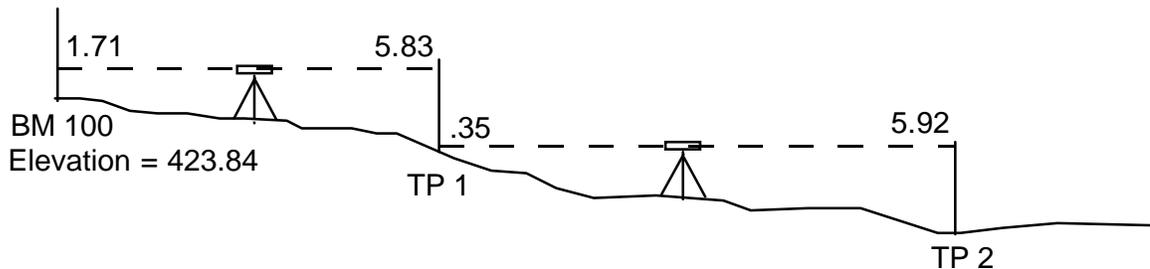
All problems are 10 points, except for number 4 which is worth 20 points.

Answers should be given on the answer sheed provided. Be careful, with few exceptions all problems are all or nothing (I will only grade the answer sheet).

1. A preengineering baseline was run down a very steep hill. Rather than measure horizontally downhill with the steel tape, the surveyor measured the vertical angle with a theodolite and the slope distance with a 200' steel tape. The vertical angle was $-24^{\circ}31'$ turned to a point on a plumbed range pole 5.24' above the ground. The fully corrected slope distance from the theodolite to the point on the range pole was 152.32 ft. The theodolite's optical center was 4.79 ft above the upper baseline station at 120 + 72.35, and has an elevation of 943.26 ft. Find the chainage and elevation of the lower station.



2. Prepare a set of level notes for the survey illustrated.



3. The slope distance between two points, as measured by EDM, is 4532.52 ft and the vertical angle is $2^{\circ}43'26''$. If the elevation of the instrument station is 640.21, and the height of the instrument, height of target, and height of EDM reflector are all equal to 5.34 ft, compute the elevation of the target station.
4. A four-sided closed traverse has the following angles and distances:
A = $50^{\circ}13'$ AB = 714.15 ft.
B = $106^{\circ}49'$ BC = 604.36 ft.
C = $77^{\circ}21'$ CD = 389.13 ft.
D = $125^{\circ}37'$ DA = 784.39 ft.
The bearing of AB is $N69^{\circ}53'E$.
 - a. Compute both bearings and azimuths for all sides

- b Compute the latitudes and departures.
 c Compute the linear error of closure and the accuracy ratio (with 1 in the numerator).
- A transit ($h_i = 1.527$ m) at control station A (elevation = 143.613 m) is sighted at control station B with the following results: stadia interval = 1.148 m; rod reading = 0.753 m with a vertical angle of $+2^\circ 34'$. Determine the horizontal distance AB, and the elevation of station B.
 - Given PI @ $7 + 53.21$, $\Delta = 28^\circ 45'$, and $R = 675$ ft. Determine the stationing of the BC and EC.
 - Given the following vertical curve data: PVI @ $8 + 25.712$; $L = 150$ m; $g_1 = -2.3\%$; $g_2 = +1.7\%$; elevation of PVI = 724.531 m, compute the elevation of the curve low point.
 - At 25-ft intervals along a straight base line, a series of perpendicular offset measurements were taken to define an irregular lake shore. The successive measurements (in feet) were as follows: 0.0, 6.2, 11.5, 15.1, 17.6, 21.7, 27.8, 23.5, 18.7, 10.8, 5.4, and 0.0. Determine the area (in sq. ft.) included between the base line and the lake shore boundary.
 - Given the following level notes for a cross-section in a stream, determine the total flow Q in cfs.

Point	BS	HI	FS	Elevation	Avg. Velocity
BM	5.2	4247.8		4242.64	
North Boundary (NB)			5.64	4242.24	
NB + 2'			5.87	4242.01	
Water Level NB + 2.7'			6.03	4241.85	
NB + 4'			8.73	4239.15	
NB + 6'			10.19	4237.69	
NB + 8'			10.43	4237.45	
NB + 10'			9.97	4237.91	
NB + 12'			9.16	4238.72	
Water Level NB +			6.03	4241.85	
South Boundary			5.68	4242.20	

ANSWERS

1. Chainage _____ Elevation _____

2. Level Notes

Station	BS	HI	FS	Elevation

3. Elevation _____

4.

Side	Azimuth	Bearing	Latitude	Departure
AB				
BC				
CD				
DA				

Error _____

Accuracy _____

5. Distance AB _____ Elevation B _____

6. Station BC _____ Station EC _____

7. Elevation _____

8. Area _____

9. Q _____