

NAME _____ Score _____

CEEN 113-1 Engineering Measurements

Dr. Nelson

Exam #3

Fall 1996

Time Limit: 2 hrs. 10 minutes. 1 point penalty for every 2 minutes over the limit. You must allow yourself 25 minutes for each problem. If you aren't sure about a problem move on to the next one so that you can be sure and have enough time to finish easier problems.

Section I - Problems (100 pts)

1. (20 pts) A sanitary sewer is to be constructed from an existing MH #1 (invert elevation = 142.380 ft.) @ .72 percent slope for a distance of 343 ft. to proposed MH #2. The elevations of the offset grade stakes are as follows: 0+00=153.214, 0+50=154.025, 1+00=152.786, 1+50=152.143, 2+00=151.540, 2+50=153.638, 3+00=155.273, 3+43=154.985. Prepare a grade sheet showing stake-to-batter-board distances in feet. Use a 14 foot grade rod.

2. (20 pts) Compute the area of the two cross sections shown and then compute the volume (yd^3) of fill using both the average end area, and trapezoidal methods. Measurements are given in feet. Be sure to note that the horizontal and vertical scales are different.

Volume End Area _____.

Volume Prismoidal _____.

3. (20 pts) The figure on the next page shows plan, profile, cross section of pavement and curbs, and proposed curb locations with offset stakes for the north side curb of Oak Avenue (in metric units).
- Compute the final centerline road elevations at the points of the curve, 0+15 and 1+00, and at all even 20-m stations.
 - Compute the top-of-curb elevations from 0+15 to 1+00.
 - Using the grade stake elevations shown in the following table, calculate the cuts/fills for the curb from 0+15 to 1+00.
 - For the intersection curve at Elm Street, Station A to Station D compute the length of arc, and the curb line gradient percent, A to D.
 - Determine the proposed curb elevations at stations B, C, and D such that all arc segments are equal ($AB = BC = CD$).
 - Using the grade stake elevations shown in the following table, Determine the cut/fills for stations B, C, and D.

Station	Grade Stake Elev.
D	186.567
C	186.575
B	186.447
0+15(A)	186.720
0+20	186.387
0+40	185.923
0+60	186.425
0+72	186.707
0+80	187.200
1+00	187.527

4. (20 pts) For the horizontal curve below determine the following: (use a deflection angle equal to 65° if you cannot compute a in a reasonable amount of time).
- a (6 pts) The tangent deflection angle _____.
 - b (2 pts) The degree of the curve = _____.
 - c (2 pts) The length of the curve = _____.
 - d (2 pts) The station of the BC = _____.
 - e (2 pts) The station of the EC = _____.
 - f (2 pts) The bearing of the back tangent _____.
 - g (2 pts) The deflection angle from the BC to station 54+00 _____.
 - h (2 pts) The chord distance from the BC to station 54+00 _____.

5. (20 pts) For the vertical curve shown below, compute the required centerline elevations or stations:

- a Station 33+60.00 is at elevation = _____.
- b Station 46+95.00 is at elevation = _____.
- c Station 51+22.46 is at elevation = _____.
- d Elevation 4423.15 is at station(s) _____.
- e Elevation of the high point on the curve _____.