CIVL 1101

Fall 2023

REVIEW FOR FINAL EXAM

1. A random error of ±0.11 ft is estimated for each of 12 length measurements that are added together to get the total length. What is the estimated total error for the total length?

   A. ±0.38 ft
   B. ±0.33 ft
   C. ±0.28 ft
   D. ±0.19 ft
   E. ±0.01 ft

2. What is the distance to the flag pole if the pole is 35.0 ft in height and the measured angle $\alpha = 7° 45' 30"$.
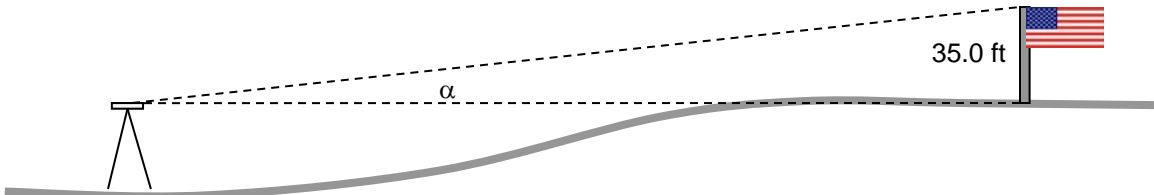
   A. 4.87 ft
   B. 35.0 ft
   C. 100 ft
   D. 257 ft
   E. 295 ft

Point	BS	HI	FS	Elevation
BM$_1$	1.23			100.00
TP$_1$	2.25		4.52	
TP$_2$	6.25		4.65	
TP$_3$	4.23		3.21	
TP$_4$	1.47		5.69	
BM$_2$			8.42	
			Change in elevation	

3. Complete and check the above set of level notes and estimate the height of the instrument between points TP$_2$ and TP$_3$.

   A. 102.42 ft
   B. 101.58 ft
   C. 100.56 ft
   D. 97.36 ft
   E. 95.48 ft

4. Complete and check the above set of level notes and estimate the elevation of point BM$_2$.

   A. 101.02 ft
   B. 100.02 ft
   C. 98.02 ft
   D. 97.35 ft
   E. 88.94 ft

1.21   6.71

BM   2.34   7.53

Elevation 432.91

TP₁

TP₂
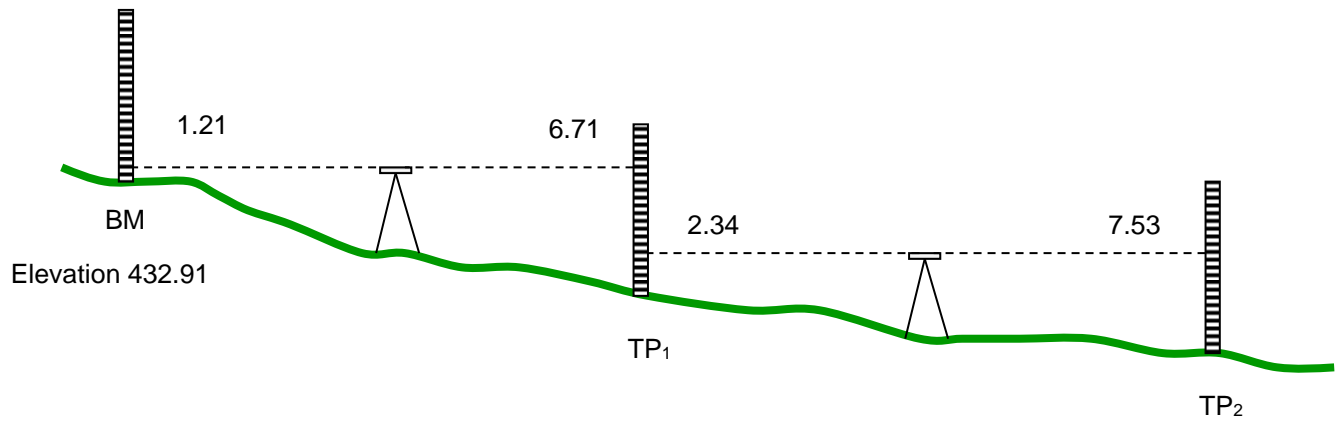
Point	BS	HI	FS	Elevation
BM₁				
TP₁				
TP₂				
			Change in elevation	

5. Develop and check a set of level notes from the above figure. What is the FS at point TP₂?

    A.   1.34 ft
    B.   3.20 ft
    C.   4.41 ft
    D.   6.71 ft
    E.   7.53 ft

6. What is the change in elevation between points BM₁ and TP₂?

    A.   -16.40 ft
    B.   -10.69 ft
    C.   4.54 ft
    D.   10.94 ft
    E.   432.91 ft

From the topographic data given in the figure below, answer the following four questions.
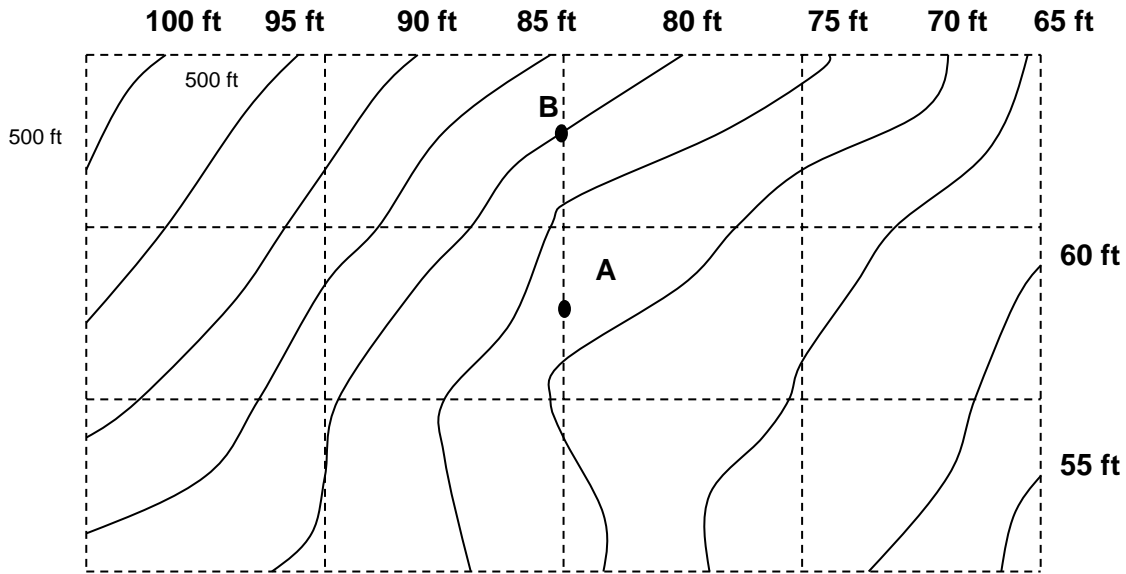
7. Estimate the elevation of Point A?

   A. 65 ft
   B. 68 ft
   C. 70 ft
   D. 73 ft
   E. 75 ft

8. Which of the following values is most nearly slope between Point A and Point B?

   A. 1%
   B. 3%
   C. 5%
   D. 7%
   E. 9%

9. For the following site data, what would be an appropriate square grid spacing to develop a contour map using one-foot intervals?

   A. 5 foot
   B. 10 foot
   C. 15 foot
   D. 20 foot
   E. 25 foot

Side	Distance
AB	100.0
BC	150.0
CD	200.0
DA	100.0

| Point	Elevation
A	100.0
B	105.0
C	108.0
D	105.0

Consider the linear-elastic prismatic bar fixed on the left-hand-side and loaded by an axial force at the right-hand-side, as shown in figure below.
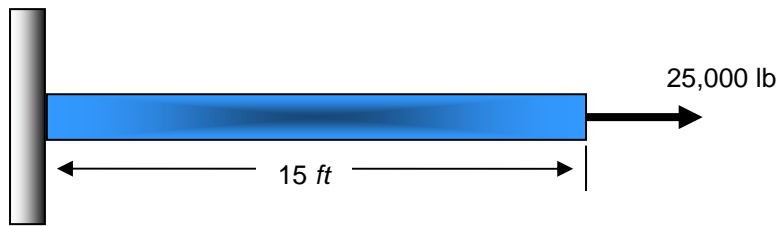
10. If the bar fails at strains greater than 0.05, what is the largest allowable deformation of bar to prevent failure?

   A.   11 inches
   B.   9 inches
   C.   7 inches
   D.   5 inches
   E.   2 inches

11. If the bar yields at a deformation of 0.25 inches under an axial load, estimate the yield stress in the material if the modulus of elasticity of 29,000 ksi?

   A.   20 ksi
   B.   40 ksi
   C.   60 ksi
   D.   80 ksi
   E.   100 ksi

12. What is the deformation of the bar shown above if its cross-sectional area is 0.5 in^2 and the modulus of elasticity of the material is 29,000 ksi?

   A.   0.03 inches
   B.   0.31 inches
   C.   0.62 inches
   D.   1.25 inches
   E.   2.50 inches

Construct **ten** beams, each having the dimensions shown in the figure below. Include a "make-sure-you-have-enough" factor of 1.2 in your mix calculations. Assume a *w/c* ratio of 0.35 and a mix design of 1:2:3. All weights should be reported to the nearest quarter-pound. Assume concrete weights 145 lb/ft^3.
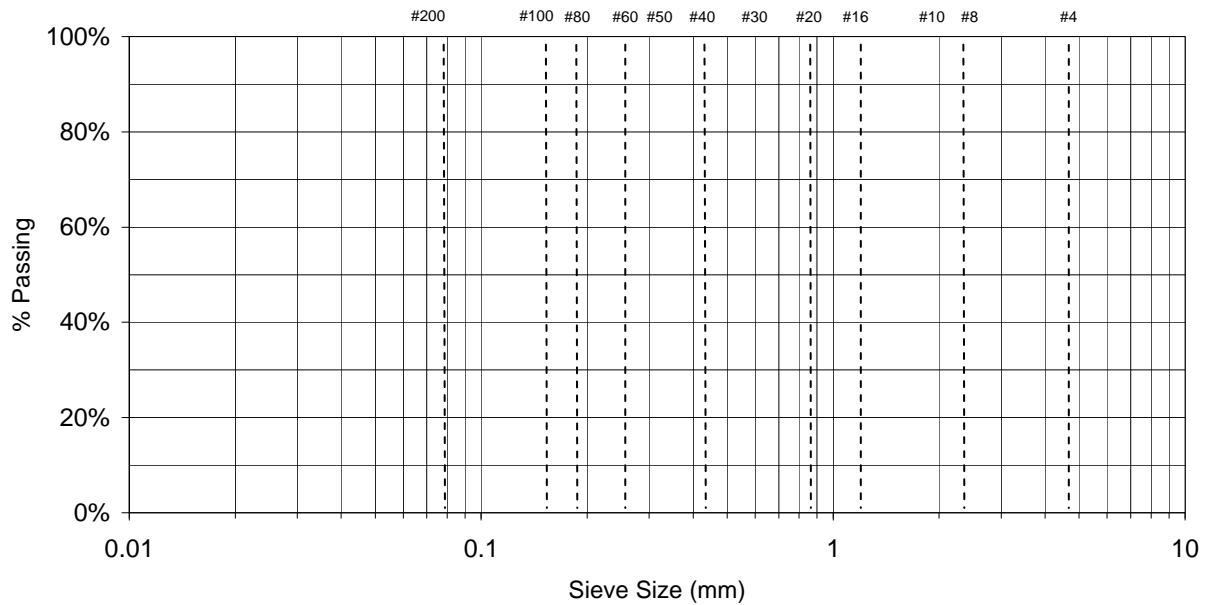

Beam dimensions

6"

30"

4"
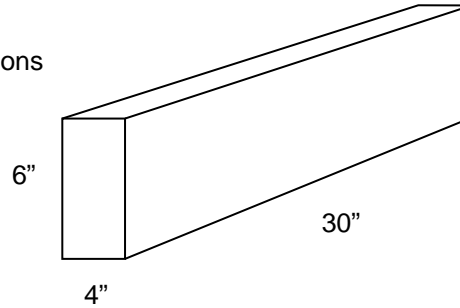
13. The total volume of concrete required for this application is estimated to be:

    A.   1,080 in^3
    B.   2,700 in^3
    C.   7,200 in^3
    D.   8,640 in^3
    E.   9,640 in^3

14. The weight of cement required to make 600 lbs of the concrete mix describe above is:

    A.   40 lbs
    B.   60 lbs
    C.   80 lbs
    D.   100 lbs
    E.   120 lbs

15. The weight of course aggregate required to make 300 lbs of the concrete mix describe above is:

    A.   75 lbs
    B.   100 lbs
    C.   125 lbs
    D.   150 lbs
    E.   175 lbs

From the data given below, develop a particle-size distribution plot. Use the table and blank graph shown below:

Sieve Number	Diameter (mm)	Mass of Soil Retained on Each Sieve (g)	Percent Retained (%)	Cumulative % Retained	Percent Finer (%)
4	4.750	0.0			
8	2.360	40.0			
16	1.180	100.0			
30	0.600	100.0			
50	0.300	100.0			
100	0.150	60.0			
PAN	---	0.0			

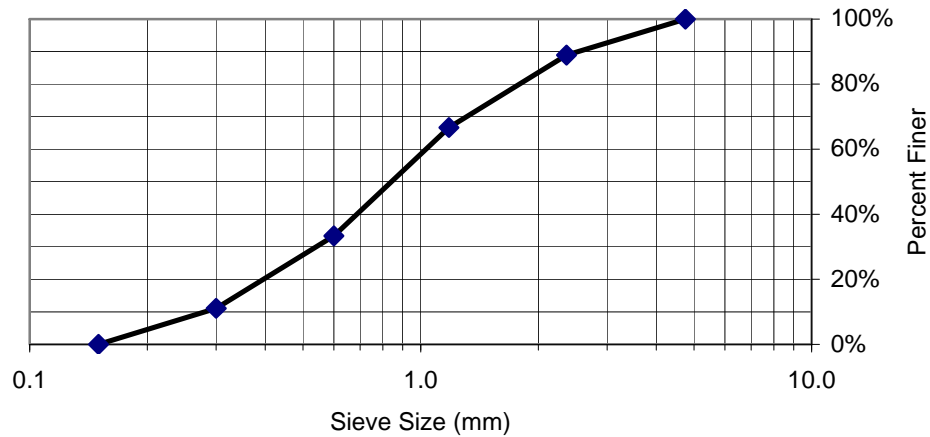Use the above sieve analysis to answer the following three questions.

16. The percent passing the #30 sieve may be most closely approximated as:

A. 100%
B. 80%
C. 40%
D. 20%
E. 10%

17. The effective size of the soil may be most closely approximated as:

A. 0.01 mm
B. 0.10 mm
C. 0.20 mm
D. 0.25 mm
E. 0.40 mm

Consider the particle-size distribution plot shown below.

Sieve Size (mm)

18. The effective size of the soil shown in the graph above is most closely approximated by:

   A.   0.3 mm
   B.   0.4 mm
   C.   0.5 mm
   D.   0.6 mm
   E.   0.7 mm

19. The particle-size D_{30} is most closely approximated as:

   A.   0.55 mm
   B.   0.65 mm
   C.   0.75 mm
   D.   0.85 mm
   E.   1.05 mm

20. Which of the following filtration mechanisms is **not** involved in removing suspended solids in a granular-media filter?

   A.   interception
   B.   straining
   C.   flocculation
   D.   hydration
   E.   sedimentation

21. The hydraulic loading rate in the 3.5 inch diameter filters in lab, with a flowrate of 1,250 ml/min, is most nearly approximated as:

   A.   1.0 gpm/ft^2
   B.   2.0 gpm/ft^2
   C.   3.0 gpm/ft^2
   D.   4.0 gpm/ft^2
   E.   5.0 gpm/ft^2

22. The backwash velocity required to expand a sand bed filter to a porosity of 0.70 for a sand with a settling velocity is 0.20 ft/s and the initial porosity of the sand is 0.35 is most nearly approximated as:

   A.   0.01 ft/s
   B.   0.03 ft/s
   C.   0.04 ft/s
   D.   0.05 ft/s
   E.   0.07 ft/s

time (min)	Flowrate (ml/min)	Turbidity (NTU)	V (ml)	Average Turbidity (NTU)
0	1000	2	---	---
10	1000	2		
20	900	3		
30	900	5		
40	800	6		
50	800	8		
60	---	10		
		Sum		

Initial NTU
100

23. The results of a filter run, operated in a manner identical to that used in lab, are shown in the table above. Which of the following volumes most closely estimates the total volume treated after 60 minutes?

   A. 24,000 ml
   B. 36,000 ml
   C. 48,000 ml
   D. 54,000 ml
   E. 72,000 ml

24. Which of the following values most closely estimates the average turbidity after 60 minutes?

   A. 0 NTU
   B. 3 NTU
   C. 5 NTU
   D. 7 NTU
   E. 9 NTU

25. If the average turbidity is 10 NTU at the end of 60 minutes, which of the following values most closely estimates the %NTU removed?

   A. 100%
   B.   95%
   C.   90%
   D.   85%
   E.   80%

$$v = v_s \alpha_e^{4.5} \qquad L_e = \frac{L(1-\alpha)}{1-\left(v/v_s\right)^{0.22}}$$

7.48 gallons = 1 ft^3
3.785 liters = 1 gallon