Civil Breadth AM-Spring 2019
Mini Exam#2

General instructions for homework submittal

1- Detailed solutions, sketches, cash flow diagrams, and free body diagrams should be included. Not just circle or mark the answer. ASSUME ANY MISSING INFORMATION.

2- Referenced equations, tables, illustrations, and figures should cited in the solutions.

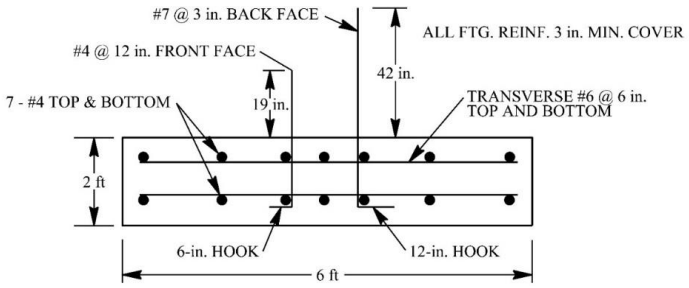
3- All solved mini exams must be submitted to get a certificate of completion or repeat the course in the future if needed.

4- It is due ONE week from the day of receiving it.

5- You may scan and email to info@passpe.com

#1- Quantity Take-Off

Given: A reinforced-steel wall footing with a cross section is shown. The length of the wall footing is 40-ft.



Find: The weight of reinforcing steel (lb) required for ALL transverse #6 bars is most nearly:

(A) 653
(B) 1305
(C) 1322
(D) 2010

Solution:

Answer:( )◀

#2- Vertical Stress Increase Due To Surcharge Using Boussinesq's Equation

Given: A square area measures 50 by 50 ft in plan. It supports a pressure of 6,000 psf.

Find: The increase in vertical stress due to the applied load at a depth of 25 ft below the center of the square area using the Boussinesq stress contours is most nearly:

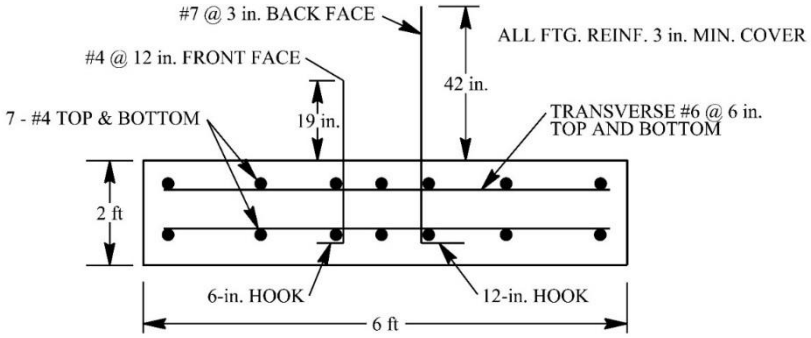
(A) 6000 psf
(B) 5000 psf
(C) 4500 psf
(D) 4200 psf

Solution:

Answer:( )

#3- Quantity Take-Off

Given: A reinforced-steel wall footing with a cross section is shown. The length of the wall footing is 40-ft.



Find: The weight of reinforcing steel (lb) required for the front and back faces (i.e # 4 and #7 bars respectively) is most nearly:

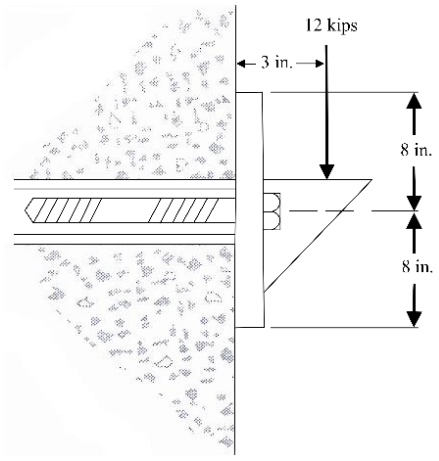
(A) 105
(B) 2031
(C) 2136
(D) 2235

Solution:

Answer: ( )◀

 # 4- Moment Definition and Pull Out Force

Given: A bracket is anchored to a concrete wall using a bolt screwed into an imbedded insert as shown in the figure.



Find: The tension (kips) in the bolt is most nearly:

(A) 0
(B) 4.5
(C) 12.0
(D) 32.0

Solution:

Answer:( )

#5- OSHA Soils Types and Maximum Slope

Given: A trench is to be excavated in a soil that has been determined to be Type A in accordance with federal OSHA regulation Subpart P. The trench excavation will not exceed 12 ft in depth and will be open for only 8 hours from the start of excavation to completion of backfilling.

Find: The maximum slope allowed by OSHA for the trench walls under these conditions is most nearly:

(A) vertical
(B) 0.5 horizontal to 1.0 vertical
(C) 0.75 horizontal to 1.0 vertical
(D) 1.0 horizontal to 1.0 vertical

Solution:

Answer:( )

#6: Cost Estimates and Duration

Given: A workforce of six electricians has to install 420 light fixtures in a new office building. Normally, two electricians working together can install one fixture in 20 min. The crew expect to have a 0.80 efficiency factor due to environmental conditions on this job site. The crews will be scheduled for 9 hour workdays, which includes 1 hour break for lunch.

Find: The duration of this construction activity (days and hours) is most nearly:

	Days	**Hours**
(A)	5	8
(B)	6	5
(C)	7	3
(D)	21	8

Solution:

Answer:( )

#7- Soil Properties

Given: A cylindrical specimen is tested in the laboratory. The following properties were obtained:
Sample diameter = 3 inches, Sample length = 6 inches
Weight before oven drying = 2.95 lb, Weight after oven drying = 2.54 lb
Oven temperature = 110 °C, Drying time = 24 hrs, and Specific gravity = 2.65

Find: The moisture content is most nearly:

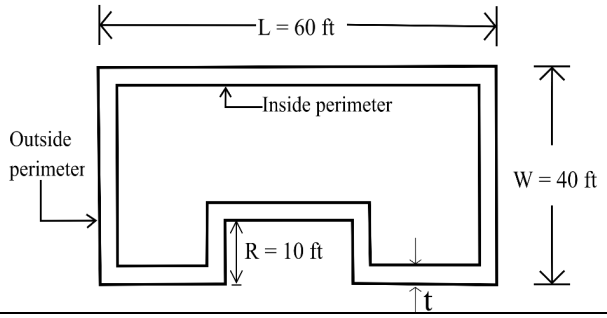
(A) 10%
(B) 14%
(C) 16 %
(D) 18%

Solution:

Answer:( )◀

#8- Quantity Take-Off

Given: A house layout is shown. The footing dimensions are 2 ft by 3 ft (width × depth). The walls height is 14 feet measured from the top of the footing. The wall thickness is 1 ft.



Find: The outside perimeter is most nearly:

(A) 200 ft
(B) 204 ft
(C) 212 ft
(D) 220 ft

Solution:

Answer:( )

#9- Soil Properties

Given: A cylindrical specimen is tested in the laboratory. The following properties were obtained:
Sample diameter = 3 inches, Sample length = 6 inches
Weight before oven drying = 2.95 lb, Weight after oven drying = 2.54 lb
Oven temperature = 110 °C, Drying time = 24 hrs, and Specific gravity = 2.65

Find: The void ratio is most nearly:

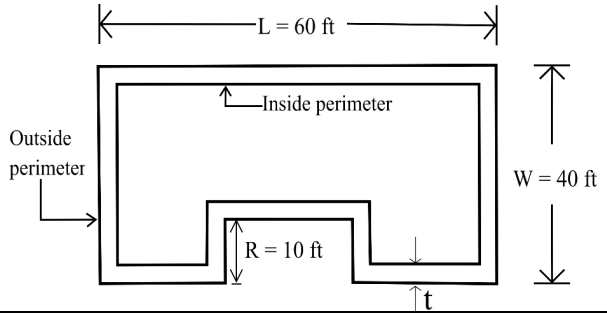
(A) 0.40
(B) 0.50
(C) 0.60
(D) 1.30

Solution:

Answer:( )◀

#10- Quantity Take-Off

Given: A house layout is shown. The footing dimensions are 2 ft by 3 ft (width × depth). The walls height is 14 feet measured from the top of the footing. The wall thickness is 1 ft.



Find: The inside perimeter is most nearly:

(A) 200 ft
(B) 204 ft
(C) 212 ft
(D) 220 ft

Solution:

Answer:( )

#11- Soil Properties

Given: A cylindrical specimen is tested in the laboratory. The following properties were obtained: Sample diameter = 3 inches, Sample length = 6 inches
Weight before oven drying = 2.95 lb, Weight after oven drying = 2.54 lb
Oven temperature = 110 °C, Drying time = 24 hrs, and Specific gravity = 2.65

Find: The degree of saturation is most nearly:

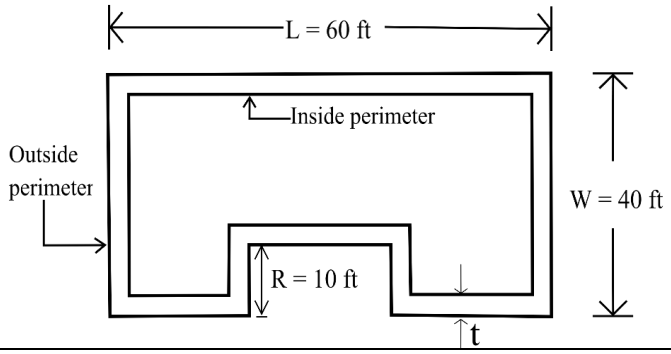
(A) 85%
(B) 80%
(C) 75%
(D) 70%

Solution:

Answer:( )◀

#12- Quantity Take-Off

Given: A house layout is shown. The footing dimensions are 2 ft by 3 ft (width × depth). The walls height is 14 feet measured from the top of the footing. The wall thickness is 1 ft.



Find: The volume of concrete (yd^3) needed for footing assuming 10% waste is most nearly:

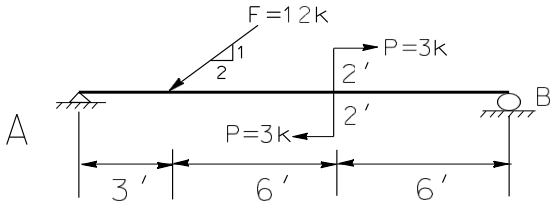
(A) 40
(B) 47
(C) 52
(D) 62

Solution:

Answer:( )

The following information is to be used for problems 13 - 15

A beam is shown:



#13- Statically Determined Beams

Find: The reactions at A (A_x, A_y) are most nearly:

(A) 10.73, 3.50 kips
(B) 9.73, 2.49 kips
(C) 8.73, 1.49 kips
(D) 7.73, 0.49 kips

Solution:

Answer:( )

#14- Statically Determined Beams

Find: The reaction at B (B_y) is most nearly:

(A) 3.87 kips
(B) 2.49 kips
(C) 1.87 kips
(D) 1.45 kips

Solution:

Answer:( )

#15-Statically Determined Beams

Find: The bending moment at the concentrated load location is most nearly:

(A) 5.5 kip-ft
(B) 10.5 kip-ft
(C) 13.5 kip-ft
(D) 18.5 kip-ft

Solution:

Answer:( )

#16- Footing Design

Given: A square footing is embedded 3 ft in a sand layer. The concentric column load of 150 k is applied on the footing. A water table is located 10 ft below the bottom of the footing. Minimum factor of safety for ultimate bearing capacity = 3.0. Unit weight of soil = 125 lb/ft^3. Unit weight of concrete = 145 lb/ft^3. Angle of internal friction of sand = 32°

$For\ \phi = 32° \rightarrow N_c = 44.04; N_q = 28.52; N_\gamma = 26.87$

Find: The minimum footing size required (ft) is most nearly:

(A) 4.5
(B) 5.0
(C) 5.5
(D) 6.0

Solution:

Answer:( )◀

#17- Deflection Calculations

Given: A single span concrete beam is shown. The cross section of the beam is 8 inches by 14 inches. Normal weight concrete with $f_c^{'} = 4000\ psi$ was used to construct the beam. Neglect the weight of rebars.

Find: The maximum deflection (inches) due to the beam weight is most nearly:

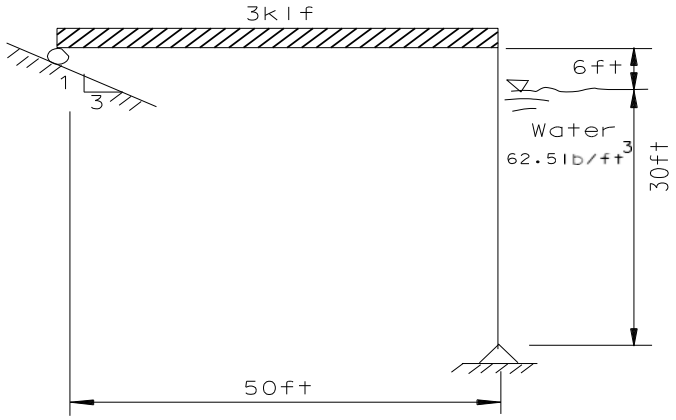
(A) 2.87
(B) 1.65
(C) 1.32
(D) 1.02

Solution:

Answer:( )

The following information is to be used for problems 18 & 19

Consider only 1-ft length of the frame shown.



#18- Statically Determined Frame

Find: The external reactions (kips) at roller support A: *Ax & Ay* are most nearly:

(A) 21.7, 65.0
(B) 21.7, 68.0
(C) 27.7, 65.0
(D) 29.7, 65.0

Solution:

Answer:( )

#19- Statically Determined Frame

Find: The external reactions (kips) at hinge B: *Bx* and *By* are most nearly:

(A) 6.9, 65.0
(B) 6.7, 65.0
(C) 6.5, 85.0
(D) 6.5, 95.0

Solution:

Answer:( )

#20- Lateral Pressure on Form Per ACI 347-14

Given: Formwork for a 9-ft-high concrete wall is required. The rate of placement is estimated to be 15ftlhr with normal internal vibration and vibrator immersion not exceeding 4 ft. The concrete to be used contains Type II cement and a retarder and weighs 155 lb/ft^3. The concrete will be placed at a concrete temperature of 80°F.

Find: The maximum design lateral concrete pressure (lb/ft^2) based on ACI 347-14 is most nearly:

(A) 1,302
(B) 1,395
(C) 1,461
(D) 1,561

Solution:

Answer:( )

#21- Quantity Take-Off Method and Cost Estimating

Given: Site preparation and grading require the placement of 20 ft of new fill. An analysis of the resulting consolidation of the underlying soft, saturated, compressible deposits reveals a mean consolidation settlement of 22 in. affecting a 21.5-acre area. Prefabricated wick drains will be used to accelerate the settlement to meet the project schedule. Because of contamination from the former site use, the effluent from the wick drains will need to be collected and treated prior to disposal at an estimated cost of $0.25 per gallon.

Find: Assuming no loss of effluent during collection, the estimated treatment and disposal cost for the wick drain effluent at this site is most nearly:

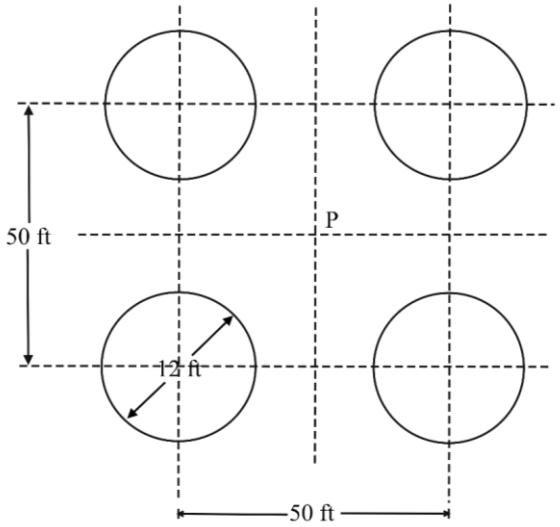
(A) $430,000
(B) $3,200,000
(C) $5,200,000
(D) $35,000,000

Solution:

Answer:( )

#22- Vertical Stress Increase Due To Surcharge Using Boussinesq's Equation

Given: A bridge pier is supported by four circular footing as shown. Each footing carries 200 kips. The four footings are arranged to form a square or 50 ft on each side as shown.



Find: Using Boussinesq Stress Contour Chart, the increase in vertical stress (ksf) as Point P of the center of the square at a depth of 24 ft below the bottom of the footing, is most nearly:

(A) 0.01
(B) 0.02
(C) 0.04
(D) 0.10

Solution:

Answer:( )

23- SPT per ASTM D698

Given: The geotechnical report for a project includes test borings and laboratory testing for the project area and potential borrow locations. The test borings include Standard Penetration Test (SPT) blow counts and driven rind samples (with densities and moisture contents). Laboratory test results include gradations, standard Proctors (ASTM D698), sulfates, and shear strengths.

Find: What can be estimated from these results:

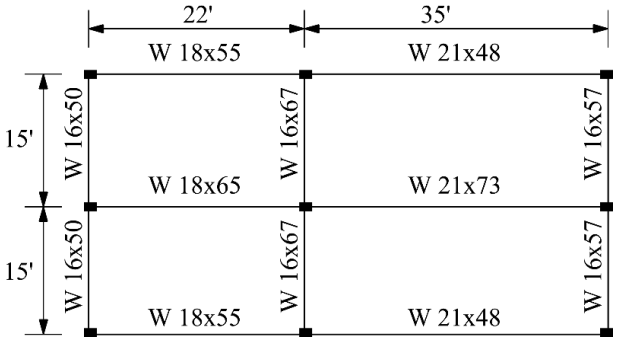
(A) Neither shrink nor swell
(B) Both shrink and swell
(C) Shrink can be estimated, but not swell
(D) Swell can be estimated, but not shrink

Solution:

Answer:( )

24- Quantity Take-Off Method and Cost Estimating

Given: A framing plan for a one-story steel frame is shown below. The columns are 18 feet in length. The sizes of columns are as follows:
i) W12×40 for perimeter columns, and ii) W 12×58 for interior Column.



Find: The total weight (tons) of steel used for the given frame is most nearly:

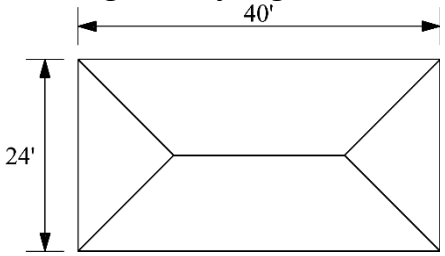
(A) 7
(B) 9
(C) 11
(D) 14

Solution:

Answer:( )◄

25- Quantity Take-Off Method and Cost Estimating

Given: The wood frame roof plan for a storage facility is given below. The hip roof has a pitch of 6/12.



Find: The number of plywood sheets needed for the roof assuming 9% waste is most nearly:

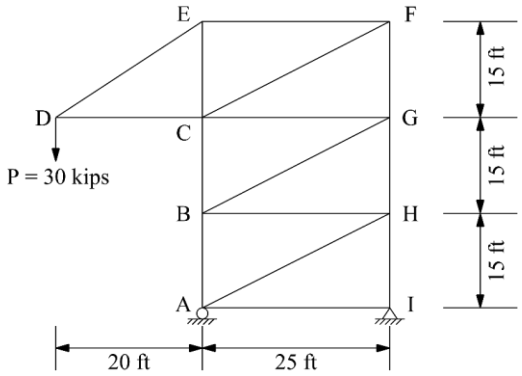
(A) 30
(B) 32
(C) 34
(D) 37

Solution:

Answer:( )◀

26- Statically Determinate Truss Analysis

Given: A truss is shown below.



Find*:* The number of zero force members is:

(A) None
(B) 2
(C) 3
(D) 5

Solution:

Answer:( )