

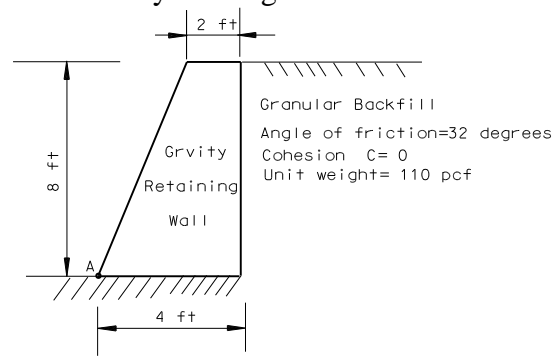
Civil Breadth AM-Spring 2019 Mini Exam#1

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 be 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- Factor of Safety Against Overturning

Given: A masonry gravity retaining wall having a unit weight of 150 pcf is shown in the figure. Use the Rankine active earth pressure theory and neglect wall friction.



Find: The factor of safety against overturning about the toe at Point A is most nearly:

- (A) 3.1
- (B) 2.5
- (C) 2.2
- (D) 0.3

Solution:

Answer: () ◀

2- Slope Stability per OSHA Requirements

Given: An excavated sloped (on both sides) trench is 15 ft deep, 6 ft bottom width, and 105 ft long. The soil type at the location of the trench is classified to be soil type C.

Find: According to OSHA standards, the width at the top of the trench is most nearly:

- (A) 28.5 ft
- (B) 45.0 ft
- (C) 51.0 ft
- (D) 33.0 ft

Solution:

Answer: () ◀

3- Benefit Cost Ratio Calculations

Given: The City of Fresno must make a determination about the feasibility of repairing a bridge. The estimated useful life of the bridge is 40 years. The MARR is 8%. The relevant cost estimates are shown below. All costs are shown in thousands of dollars.

	Existing	Repair
Initial cost	0	80
Annual Cost (maintenance)		
Years 1-20	10	2
Years 21-40	15	3
Salvage Value	4	15

Find: The benefit-cost ratio of making repairs is most nearly:

- (A) 1.10
- (B) 1.20
- (C) 1.30
- (D) 1.50

Solution:

Answer:() ◀

4- Cost Estimating

Given: A room is 35 ft × 25 ft in plan. Ceiling height is 14 ft. Openings for doors and windows total 85 ft². The following data is given for plastering and painting operations.
Plaster and paint crew: 1 supervisor @ \$30/hr, 1 laborer @ \$12/hr, and 2 painter @ \$18/hr
Plastering productivity rate = 50 ft²/L.H. & Painting productivity rate = 150 ft²/L.H.

Find: The estimated labor cost for plastering and painting the room (walls and ceiling) is most nearly:

- (A) \$1,020
- (B) \$1,280
- (C) \$1,460
- (D) \$1,690

Solution:

Answer:() ◀

5- Uplift Force For Concrete Forms

Given: A 12-ft high concrete retaining wall, battered on one side at a ratio of 1:10 will be poured with a 150 pcf concrete to its full height in less than one hour. The calculated maximum concrete pressure in the form is 1,800 psf.

Find: The uplift force the form will be subjected to is most nearly:

- (A) 0 lb/ft
- (B) 600 lb/ft
- (C) 800 lb/ft
- (D) 1080 lb/ft

Solution:

Answer:() ◀

6- Design of Concrete Footings

Given: A clay soil deposit has the following characteristics:

Unit weight = 122 lb/ft³

Angle of internal friction = 10°

Unconfined compression strength = 2,400 lb/ft²

A square footing is to be used to support a column load = 80 k. Bottom of footing is 3 ft below the ground surface. Minimum factor of safety for ultimate bearing capacity is 3.0.

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

- (A) 6
- (B) 5
- (C) 4
- (D) 3

Solution:

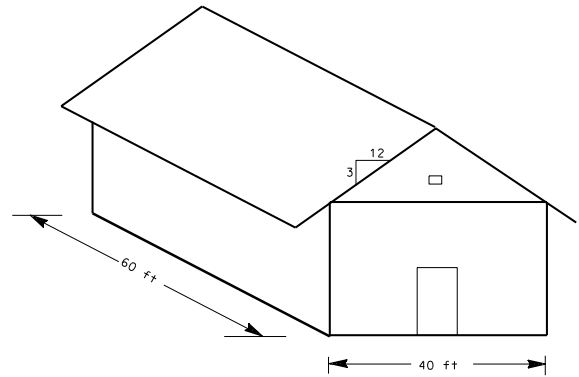
Answer:() ◀

7- Quantity Take-Off

Given: A one story building is shown. Assume overhang of 2 feet (horizontal distance)

Find: The number of plywood sheets required for the roof is most nearly:

- (A) 60 sheets
- (B) 86 sheets
- (C) 96 sheets
- (D) 104 sheets



Solution:

Answer:() ◀

The following information is to be used for problems 8, 9 & 10

The following table shows the activities and duration for a widening; installing a concrete median barrier and traffic signals in a segment of an expressway in northern California. All relationships are finish to start.

Activity	Duration (months)	Predecessor
A	5	-
B	4	A & C
C	3	A
D	3	B
E	5	B & C
F	2	D & E

8- CPM

Find: The CP is:

- (A) ACBEF
- (B) ABDF
- (C) ABEF
- (D) ACBDF

Solution:

Answer:() ◀

9- Early Start of an Activity

Find: The early start (days) for activity F is:

- (A) 15
- (B) 16
- (C) 17
- (D) 18

Solution:

Answer:() ◀

10- Effect of Lag Time on the Early Start of an Activity

Find: If activity D is lagged activity F (FF) by 3 days (FF, lag=3), which of the following statements is true?

- (A) Activity F will have the same start time because the lag has no effect
- (B) Activity F will be delayed 3 days due to the lag
- (C) Activity F will be advanced 3 days due to the lag
- (D) Activity F will be advanced 2 days due to the lag

Solution:

Answer:() ◀

11: Quantity Take off Method

Find: Which one of the steel reinforcement has the most steel area per square foot:

- (A) #4 at 6" OCEW
- (B) #5 at 9" OCEW
- (C) 5" × 5" W16 × W16
- (D) 7" × 7" W26 × W26

Solution:

Answer: ()

12- A highway contractor has located a stone deposit that can conveniently be quarried. It is estimated that 50,000 yd³ per year can be produced for 10 years. This would exhaust the supply of stone. Cleanup costs equal the value of the land at that time. If purchased from others, crushed rock would cost \$7.00/yd³ delivered to the job site. If quarried and crushed by the contractor, crushed rock would cost \$5.50/yd³ (including all equipment, labor, and supplies) delivered to the job site. The minimum attractive rate of return (MARR) is 10%.

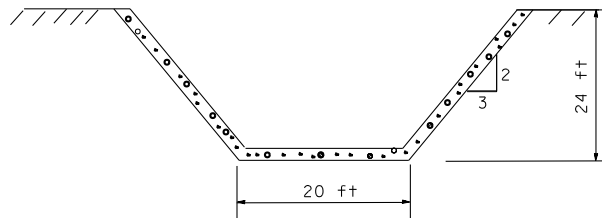
The maximum amount the contractor can afford to pay for this deposit without a financial loss is most nearly:

- (A) \$284,300
- (B) \$424,800
- (C) \$460,900
- (D) \$481,900

13- The minimum factor of safety against rotational failure for permanent slopes under long-term non-seismic conditions should meet or exceed:

- (A) 1.0
- (B) 1.1
- (C) 1.5
- (D) 3.0

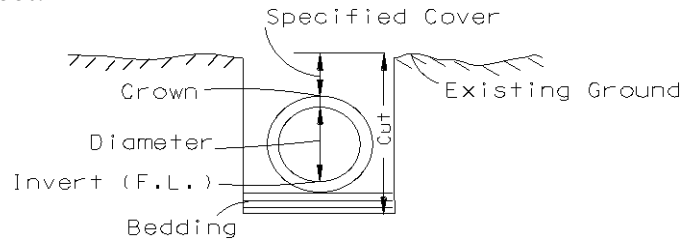
- 14-** A bridge footing is to be constructed in sand. The water table is at the ground surface. The ultimate bearing capacity would be based on what type of soil unit weight?
- (A) Saturated unit weight
 - (B) Dry unit weight
 - (C) Buoyant unit weight
 - (D) Total unit weight
- 15-** A company can manufacture a product with off-the shelf hand tools. Costs will be \$1000 for tools and \$1.50 manufacturing cost per unit. As an alternative, an automated system will cost \$15,000 with a \$0.50 manufacturing cost per unit. With an annual anticipated volume of 5000 units and neglecting interest, the break-even point is most nearly:
- (A) 2.8 years
 - (B) 3.6 years
 - (C) 15.0 years
 - (D) Never
- 16-** A sheet pile wall retaining a silty sand has an angle of internal friction (ϕ) = 30° . Using the Rankine formula, the active earth pressure coefficient is most nearly:
- (A) 0.30
 - (B) 0.47
 - (C) 1.00
 - (D) 3.25
- 17-** The cross section of an 800 ft long irrigation channel is shown. The walls and bottom of the channel have a uniform thickness of 8 inches. Assume 10% waste.



The volume of the concrete delivered to build this channel is most nearly:

- (A) 2105 yd³
- (B) 2115 yd³
- (C) 2215 yd³
- (D) 2315 yd³

- 18-** A new 48-inch inside diameter water line is proposed for a new facility. The minimum bedding and cover thicknesses are 6-inches, and 2.5 feet respectively. The pipe thickness is 4 inches. The minimum width of the ditch to accommodate the pipe should be the pipe diameter plus 6 feet.

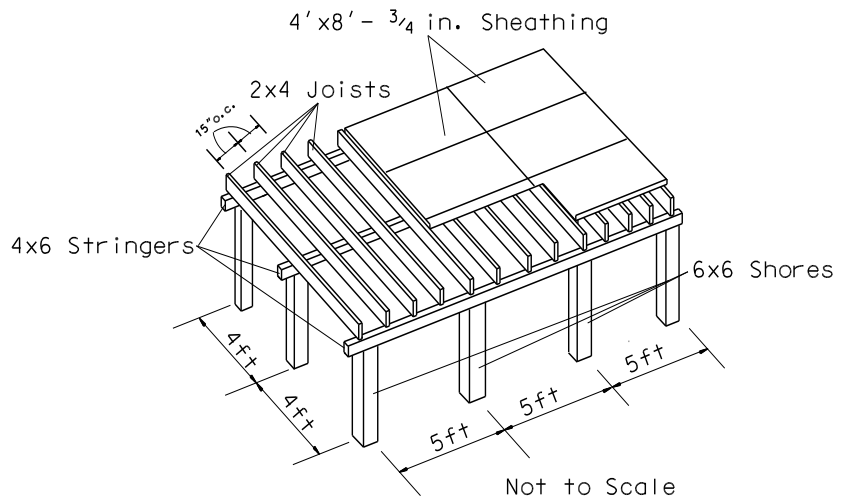


The volume of earthwork (excavation) for a 2 mile- pipeline long is most nearly:

- (A) 28,900 yd³
- (B) 30,000 yd³
- (C) 32,000 yd³
- (D) 34,000 yd³

The following information is to be used for problems 19 to 21

The given illustration is a typical shoring (false work) for a concrete slab construction.



19: Load Path

Find: Which of the following is the correct load path of the fresh concrete (construction load):

- (A) Sheathing, stringers, joists, and shores
- (B) Sheathing, joists, stringers, and shores
- (C) Sheathing, stringers, and shores
- (D) Sheathing, joists, and shores

Solution:

Answer: () ◀

20: Stresses on Joists

Find: The joists should be designed and checked to resist which of the following:

- (A) Axial tensile strength
- (B) Bending and horizontal shear stresses
- (C) Flexure and buckling stress
- (D) Shear stress perpendicular to grain

Solution:

Answer: () ◀

21: Stresses on Shores

Find: The shores should be designed and checked to resist which of the following:

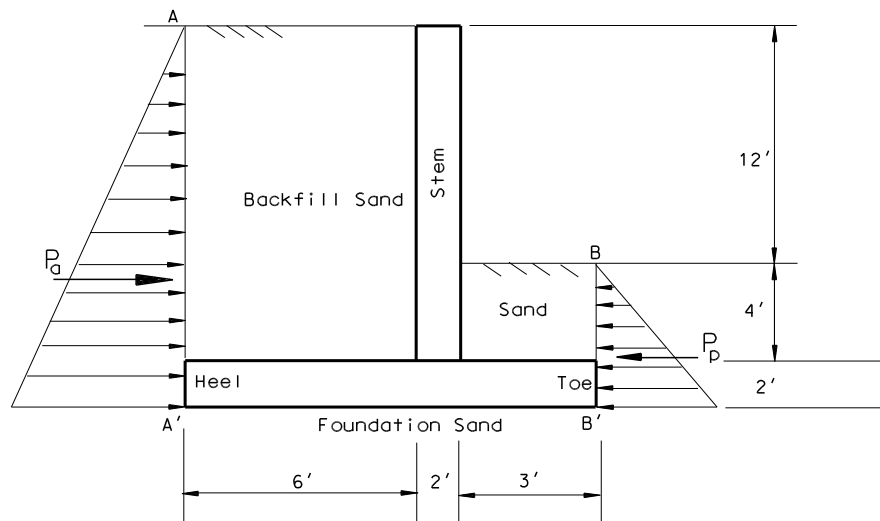
- (A) Axial tensile strength
- (B) Bending and horizontal shear stresses
- (C) Axial compression and buckling stresses
- (D) Shear stress

Solution:

Answer: () ◀

The following information is to be used for problems 22 to 25

A cross-section of a concrete cantilever wall is shown below. The foundation sand below the base of the wall, in front of the toe, and over the toe has a unit weight $\gamma_{soil} = 120 \text{ lb/ft}^3$, and friction angle of $\phi = 30^\circ$. The backfill sand has a unit weight $\gamma_{backfill} = 125 \text{ lb/ft}^3$ and a friction angle of $\phi = 34^\circ$. The water table is a considerable distance below the base of the wall and the backfill is well drained. Concrete weighs $\gamma_{concrete} = 150 \text{ lb/ft}^3$. Assume base coefficient of friction $\mu = 0.36$



22: Maximum Lateral Earth Pressure

Find: The maximum lateral active earth pressure is most nearly:

- (A) 425 psf
- (B) 565 psf
- (C) 640 psf
- (D) 765 psf

Solution:

Answer:() ◀

23: Maximum Lateral Force due to Earth Pressure

Find: The maximum lateral active force is most nearly:

- (A) 1425 plf
- (B) 3565 plf
- (C) 4425 plf
- (D) 5725 plf

Solution:

Answer:() ◀

24: Maximum Lateral Passive Earth Pressure

Find: The maximum lateral passive earth pressure is most nearly:

- (A) 1300 psf
- (B) 1440 psf
- (C) 2045 psf
- (D) 2160 psf

Solution:

Answer:() ◀

25: Maximum Lateral Passive Force

Find: The maximum lateral passive force is most nearly:

- (A) 4300 plf
- (B) 5440 plf
- (C) 6480 plf
- (D) 7555 plf

Solution:

Answer:() ◀