PE
civil: transportation
practice exam
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About NCEES
NCEES is a nonprofit organization made up of the U.S. engineering and surveying licensing boards in all 50 states, the U.S. territories, and the District of Columbia. We develop and score the exams used for engineering and surveying licensure in the United States. NCEES also promotes professional mobility through its services for licensees and its member boards.

Engineering licensure in the United States is regulated by licensing boards in each state and territory. These boards set and maintain the standards that protect the public they serve. As a result, licensing requirements and procedures vary by jurisdiction, so stay in touch with your board (ncees.org/licensing-boards).

Exam format
The PE Civil: Transportation exam is computer-based. It contains 80 questions and is administered year-round via computer at approved Pearson VUE test centers. A 9-hour appointment time includes a tutorial, the exam, and a break. You have 8 hours to complete the actual exam.

In addition to traditional multiple-choice questions with one correct answer, the exam uses common alternative item types such as

• Multiple correct options—allows multiple choices to be correct
• Point and click—requires examinees to click on part of a graphic to answer
• Drag and drop—requires examinees to click on and drag items to match, sort, rank, or label
• Fill in the blank—provides a space for examinees to enter a response to the question

To familiarize yourself with the format, style, and navigation of a computer-based exam, view the video tutorials on the NCEES YouTube channel.

Examinee Guide
The NCEES Examinee Guide is the official guide to policies and procedures for all NCEES exams. During exam registration and again on exam day, examinees must agree to abide by the conditions in the Examinee Guide, which includes the CBT Examinee Rules and Agreement. You can download the Examinee Guide at ncees.org/exams. It is your responsibility to make sure you have the current version.

Scoring and reporting
Results for computer-based exams are typically available 7–10 days after you take the exam. You will receive an email notification from NCEES with instructions to view your results in your MyNCEES account. All results are reported as pass or fail.

Updates on exam content and procedures
Visit us at ncees.org/exams for updates on everything exam-related, including specifications, exam-day policies, scoring, and corrections to published exam preparation materials. This is also where you will register for the exam and find additional steps you should follow in your state to be approved for the exam.
PE CIVIL: TRANSPORTATION PRACTICE EXAM
4. A CPM arrow diagram is shown below. Nine activities have been estimated with durations ranging from 5 to 35 days. The minimum time (days) required to finish the project is most nearly:

- A. 40
- B. 42
- C. 45
- D. 50

5. A paving company purchased an asphalt paving roller for $350,000 in 2008. Assuming an average inflation rate of 3.5%, the actual replacement cost for an equivalent roller machine in the year 2025 would be $__________.

Enter your response in the blank.

6. A track loader has an initial cost of $75,000 and a salvage value of $10,000 at the end of its expected life of 10 years. Based on the straight-line method of depreciation, at the end of the track loader's 8th year, its book value is most nearly:

- A. $10,000
- B. $15,000
- C. $23,000
- D. $48,750
15. An intersection had 25 reported traffic accidents from January 1 through September 30. The ADT for this intersection is shown in the following figure. The accident rate per million entering vehicles (RMEV) for this intersection is most nearly:

- A. 4.6
- B. 3.4
- C. 0.5
- D. 0.2

16. A 10-ft-wide off-street pedestrian walkway has an effective walkway width of 6.5 ft. The peak 15-min pedestrian flow is 1,200 pedestrians. The average pedestrian speed is 280 ft/min. The platoon-adjusted LOS is most nearly:

- A. LOS B
- B. LOS C
- C. LOS D
- D. LOS E

17. A segment of a roadway has an average daily traffic of 12,350 and an annual growth rate of 7%. If this rate of traffic volume growth continues, the average daily traffic volume (vpd) in 10 years will be most nearly:

- A. 8,650
- B. 17,650
- C. 21,000
- D. 24,300
18. Match each value to its corresponding **minimum** horizontal clear-zone width (ft) for the roadway characteristics shown. Some values will be used more than once.

<table>
<thead>
<tr>
<th>DESIGN SPEED (mph)</th>
<th>ADT</th>
<th>SLOPE</th>
<th>WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>400</td>
<td>1V:4H foreslope</td>
<td></td>
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<tr>
<td>70</td>
<td>13,000</td>
<td>1V:3H backslope</td>
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<td>1V:8H foreslope</td>
<td>22</td>
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<tr>
<td>60</td>
<td>1,200</td>
<td>1V:4.5H backslope</td>
<td>16</td>
</tr>
<tr>
<td>45</td>
<td>7,000</td>
<td>1V:4H foreslope</td>
<td>10</td>
</tr>
<tr>
<td>35</td>
<td>1,000</td>
<td>1V:6H foreslope</td>
<td>7</td>
</tr>
</tbody>
</table>
21. Which of the following end treatments are **not** crashworthy?

Select the **two** that apply.

- □ A. Turndown-style end terminal
- □ B. Slotted rail terminal
- □ C. Impact attenuator
- □ D. Flared end terminal
- □ E. Thrie-beam bullnose
- □ F. Inertial barrel array
27. An existing highway has a historic site located at the PT of an existing curve with a PI located at Station 80+00, an external angle of 65°, and a radius of 1,200 ft. The curve must be relocated, moving the PI to Station 78+00. The external angle and the PC will remain the same. The radius (ft) of the new curve is most nearly:

- A. 263
- B. 314
- C. 886
- D. 1,200

28. An alert driver with a perception-reaction time of 2.5 sec is driving at the posted speed of 45 mph and must stop suddenly to avoid an obstacle in the roadway. An impaired driver with a perception-reaction time of 3.5 sec is traveling 10 mph over the speed limit. The increase in the distance (ft) traveled by the impaired driver before the brakes are applied is most nearly:

- A. 37
- B. 66
- C. 118
- D. 283
49. Select the characteristics that are typical of modern roundabouts in the United States.
**PE CIVIL: TRANSPORTATION SOLUTIONS**

1. Horizontal length of side slope = $14 \times \frac{3}{2} = 21.0$ ft  
   
   Slope length = $\sqrt{(14)^2 + (21)^2} = 25.24$ ft  
   
   Cross-sectional area of lining = $[(2 \times 25.24) + 9] \frac{7}{12} = 34.70$ ft$^2$  
   
   Volume of lining = $\frac{(34.70 \times 227)}{27} = 291.7$ yd$^3$  
   
   Delivered volume = $291.7$ yd$^3 \times 1.12 = 327$ yd$^3$  
   
   **THE CORRECT ANSWER IS: D**

2. Crew cost = 2($50/hr) = $100/hr  
   
   Days allowed = $\frac{4,000}{(8 \text{ hr/day})($100/hr)} = 5$ days  
   
   **THE CORRECT ANSWER IS: C**

3. $1,000$ kN = $1,000$ kN $\times \frac{1 \text{ ton}}{8,896444$ kN} = 112.4$ tons  
   
   150 tons > 112.4 tons  
   
   **THE CORRECT ANSWER IS: C**

4. Activities: 7 + 4 + 5  
   Days: 30 + 10 + 10 = 50 days  
   
   **THE CORRECT ANSWER IS: D**

5. Use the compound interest formula ($F/P$, $i\%$, $n$).  
   350,000 $(1 + 0.035)^{17} = 628,136.44$  
   
   **THE CORRECT ANSWER IS: 628,000 to 628,200**

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6. Calculate annual depreciation:

\[ D = \frac{\$75,000 - \$10,000}{10} \]

\[ D = \$6,500/\text{year} \]

Book value after 8 years = $75,000 − (8)(\$6,500) = $23,000

THE CORRECT ANSWER IS: C

7. Determine the annual debt service:

\[ R = P \frac{i}{1 - (1 + i)^{-n}} \]

where

- \( R \) = annual payment
- \( P \) = present worth of investment
- \( i \) = interest rate
- \( n \) = number of interest periods

\[ R = (\$6,987,500) \left( \frac{0.04}{1 - (1 + 0.04)^{-25}} \right) \]

\[ = \$447,283.59 \]

Alternatively, from economic factor tables available in various references, capital recovery factor (CRF) = 0.06401

\[ A = P(A/P, 4\%, 25) \]

\[ = (\$6,987,500)(0.0640) \]

\[ = \$447,271.56 \]

THE CORRECT ANSWER IS: D
15. Total vehicles entering intersection = 2,000 + 6,000 + 4,000 + 8,000 = 20,000 vpd.

\[
\text{Rate} = \frac{\text{(number of accidents)}(10^6)}{\text{(ADT)}(\text{number of years})(365 \text{ days/ year})}
\]

\[
= \frac{(25)(10^6)}{(20,000)(9/12)(365)} = 4.6 \text{ RMEV}
\]

or

\[
\text{Rate} = \frac{\text{(number of accidents)}(10^6)}{\text{(ADT)}(\text{number of days})}
\]

Number of days during Jan. through Sept. = 31 + 28 + 31 + 30 + 31 + 30 + 31 + 31 + 30 = 273

\[
\text{Rate} = \frac{(25)(10^6)}{(20,000)(273)} = 4.6 \text{ RMEV}
\]

**THE CORRECT ANSWER IS: A**

\[ v_p = \frac{v_{15}}{15 \times W_E} \]

where

- \( v_p \) = pedestrian unit flow rate (p/ft/min)
- \( v_{15} \) = peak 15-min flow (p)
- \( W_E \) = effective walkway width (ft)

\[ v_p = \frac{1,200}{15(6.5)} = \frac{1,200}{97.5} = 12.3 \]

\[ A_p = \frac{S_p}{v_p} \]

where

- \( A_p \) = pedestrian space (ft²/p)
- \( S_p \) = pedestrian speed (ft/min)
- \( v_p \) = pedestrian flow per unit width (p/ft/min)

\[ A_p = \frac{280}{12.3} = 22.8 \text{ ft}²/p \]

Using Exhibit 24-2 and \( A_p = 22.8 \), platoon-adjusted LOS = E.

**THE CORRECT ANSWER IS: D**

17. Given:

- ADT = 12,350 vpd
- Growth rate = 7%

Determine ADT 10 years in future assuming growth rate continues:

\[ ADT_{\text{future}} = ADT_{\text{exist}} (1 + 0.07)^{10} \]

\[ = 12,350(1.967) \]

\[ = 24,294 \text{ vpd} \]

**THE CORRECT ANSWER IS: D**

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**THE CORRECT ANSWERS ARE SHOWN ABOVE.**


For curbed sections, the recommended offset on the outside of a curve is 6 ft.

**THE CORRECT ANSWER IS: C**


Conservation of momentum principle, \( v_1 = \frac{M_v \times v_o}{(M_v + M_1)} \)

\[ M_v = 2,000 \text{ lb} \quad v_o = 45 \text{ mph} \quad M_1 = 600 \text{ lb} \]

\[ v_1 = \frac{2,000 \times 45}{2,000 + 600} = 34.6 \text{ mph} \]

**THE CORRECT ANSWER IS: A**

The turndown style and the flared end terminal are not crashworthy end treatments. The slotted rail terminal, impact attenuator, inertial barrels, and thrie-beam bullnose have all passed relevant crash tests.

THE CORRECT ANSWERS ARE: A, D


"Directional ramps with a design speed over 40 mph [60 km/h] should have a paved right shoulder width of 8 to 10 ft [2.4 to 3.0 m] and a paved left shoulder width of 1 to 6 ft [0.3 to 1.8 m]."

THE CORRECT ANSWER IS: D

23. Elevation top of curb = 100.0
   Deduct curb = −0.5
   
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   Deduct slab = −0.5
   
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   Deduct rock = −1.0
   
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<td>98.0</td>
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Consider crown: \((30/2) \times 0.02 = 0.3\) ft
Add to above to get Point A.
98.0 + 0.3 = 98.3 ft

THE CORRECT ANSWER IS: A


Paragraph 3 states "maximum curb ramp grade should be 8.33 percent."

THE CORRECT ANSWER IS: A
27. Determine existing tangent distance:

\[ T_{\text{existing}} = R \times \tan \frac{\Delta}{2} \]

\[ = 1,200 \times \tan 32.5^\circ \]

\[ = 1,200 \times 0.637 \]

\[ = 764.48 \text{ ft} \]

Determine new tangent:

\[ T_{\text{new}} = 764.48 - 200 = 564.48 \text{ ft} \]

Determine new radius:

\[ R = \frac{T}{\tan \frac{\Delta}{2}} = \frac{564.48}{0.637} \]

\[ = 886.06 \text{ ft} \]

**THE CORRECT ANSWER IS: C**

28. Distance traveled, \( D = vt \)

where \( v = \) speed

\( t = \) perception-reaction time

Distance traveled by alert driver, \( D_1 \):

\[ v_1 = \frac{45 \text{ miles}}{\text{hour}} \times \frac{5,280 \text{ ft}}{\text{mile}} \times \frac{1 \text{ hr}}{3,600 \text{ sec}} = 66 \text{ ft/sec} \]

\[ t_1 = 2.5 \text{ sec} \]

\[ D_1 = 66 \text{ ft/sec} \times 2.5 \text{ sec} = 165 \text{ ft} \]

Distance travelled by impaired driver, \( D_2 \):

\[ v_2 = \frac{55 \times 5,280}{3,600} = 80.67 \text{ ft/sec} \]

\[ t_2 = 3.5 \text{ sec} \]

\[ D_2 = 80.67 \times 3.5 = 282.3 \text{ ft} \]

Difference = 282.3 – 165 = 117.3 ft

**THE CORRECT ANSWER IS: C**

A. yield sign—correct
B. clockwise circulation
C. central island—correct
D. stop sign
E. splitter island—correct
F. stop sign
G. yield sign—correct
H. splitter island—correct
I. splitter island—correct
J. splitter island—correct

THE CORRECT ANSWERS ARE: A, C, E, G, H, I, J