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About NCEES
The National Council of Examiners for Engineering and Surveying (NCEES) is a nonprofit organization made up of engineering and surveying licensing boards from all U.S. states and territories. Since its founding in 1920, NCEES has been committed to advancing licensure for engineers and surveyors in order to protect the health, safety, and welfare of the American public.

NCEES helps its member licensing boards carry out their duties to regulate the professions of engineering and surveying. It develops best-practice models for state licensure laws and regulations and promotes uniformity among the states. It develops and administers the exams used for engineering and surveying licensure throughout the country. It also provides services to help licensed engineers and surveyors practice their professions in other U.S. states and territories.

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.

Exam-day schedule
Be sure to arrive at the exam site on time. Late-arriving examinees will not be allowed into the exam room once the proctor has begun to read the exam script. The report time for the exam will be printed on your Exam Authorization. Normally, you will be given 1 hour between morning and afternoon sessions.

Admission to the exam site
To be admitted to the exam, you must bring two items: (1) your Exam Authorization and (2) a current, signed, government-issued identification.

Examinee Guide
The NCEES Examinee Guide is the official guide to policies and procedures for all NCEES exams. All examinees are required to read this document before starting the exam registration process. You can download it at ncees.org/exams. It is your responsibility to make sure that you have the current version.

NCEES exams are administered in either a computer-based format or a pencil-and-paper format. Each method of administration has specific rules. This guide describes the rules for each exam format. Refer to the appropriate section for your exam.

Scoring and reporting
NCEES typically releases exam results to its member licensing boards 8–10 weeks after the exam. Depending on your state, you will be notified of your exam result online through your MyNCEES account or via postal mail from your state licensing board. Detailed information on the scoring process can be found at ncees.org/exams.

Staying connected
To keep up to date with NCEES announcements, events, and activities, connect with us on your preferred social media network.
CIVIL AM PRACTICE EXAM
101. A 227-ft length of canal is to be lined with concrete for erosion control. With 12% allowance for waste and overexcavation, the volume (yd³) of concrete that must be delivered is most nearly:

(A) 234
(B) 280
(C) 292
(D) 327

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

(A) $10,000
(B) $15,000
(C) $23,000
(D) $48,750

103. The budgeted labor amount for an excavation task is $4,000. The hourly labor cost is $50 per worker, and the workday is 8 hours. Two workers are assigned to excavate the material. The time (days) available for the workers to complete this task is most nearly:

(A) 3
(B) 4
(C) 5
(D) 12.5
104. 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

![CPM Arrow Diagram]

105. A bridge is to be jacked up to replace its bearings. The design requires a hydraulic ram with a minimum capacity of 1,000 kN (kilonewtons). The hydraulic rams that are available are rated in tons (2,000 lb/ton). The minimum size (tons) ram to use is most nearly:

(A) 1,110  
(B) 250  
(C) 150  
(D) 100

STRUCTURAL PM PRACTICE EXAM
513. The pipe member shown in the figure has a constant section and the following properties:

Outside diameter 10 in,
Moment of inertia 90 in^4
Area 7 in^2

Neglecting the weight of the pipe, the maximum compressive stress (ksi) at the support is most nearly:

(A) 2.9
(B) 4.9
(C) 13.3
(D) 16.2

514. A cable carrying traffic signal loads is shown in the figure. The deflection at point B is 12 in. Neglect elongation of the cable. The tension force (lb) in the cable between C and D is most nearly:

(A) 4,685
(B) 4,476
(C) 1,816
(D) 213

Horizontal length of side slope = \(14 \times \frac{3}{2} = 21.0 \text{ ft}\)

Slope length = \(\sqrt{(14)^2 + (21)^2} = 25.24 \text{ ft}\)

Cross-sectional area of lining = \(\left[(2 \times 25.24) + 9\right] \frac{7}{12} = 34.70 \text{ ft}^2\)

Volume of lining = \(\frac{(34.70 \times 227)}{27} = 291.7 \text{ yd}^3\)

Delivered volume = \(291.7 \text{ yd}^3 \times 1.12 = 327 \text{ yd}^3\)

**THE CORRECT ANSWER IS: (D)**


\[
D = \frac{\$75,000 – \$10,000}{10} = \$6,500
\]

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

**THE CORRECT ANSWER IS: (C)**


Crew cost = \(2(\$50/\text{hr}) = \$100/\text{hr}\)

Days allowed = \(\frac{\$4,000}{(8 \text{ hr/day})(\$100/\text{hr})} = 5 \text{ days}\)

**THE CORRECT ANSWER IS: (C)**


Activities: \(7 + 4 + 5\)

Days: \(30 + 10 + 10 = 50 \text{ days}\)

**THE CORRECT ANSWER IS: (D)**
510. Referring to the beam shown in the question, there is a zero moment at the hinge.

**THE CORRECT ANSWER IS: (D)**

511. \[ M_{\text{max}} = \frac{(200 \text{ lb/ft})(20 \text{ ft})^2}{8} + \frac{(1,000 \text{ lb})(20 \text{ ft})}{4} \]
\[ = 10,000 \text{ ft-lb} + 5,000 \text{ ft-lb} = 15,000 \text{ ft-lb} \]

\[ I = \frac{(4 \text{ in.})(12 \text{ in.})^3}{12} = 576 \text{ in}^4 \]

\[ f_b = \frac{Mc}{I} \]
\[ = \frac{(15,000 \text{ ft-lb})(6 \text{ in.})}{576 \text{ in}^4} \times (12 \text{ in./ft}) \]

\[ f_b = 1,875 \text{ psi} \]

**THE CORRECT ANSWER IS: (C)**

512. \[ I = \frac{bd^3}{12} - \frac{bd_1^3}{12} = \frac{8(12)^3 - 4(8)^3}{12} = 981 \text{ in}^4 \]

\[ V = 1,000 \text{ plf} \left(\frac{10 \text{ ft}}{2}\right) + \left(\frac{4,000 \text{ lb}}{2}\right) = 7,000 \text{ lb} \]

\[ \nu_{\text{horizontal}} = \frac{VQ}{IB} = \frac{7,000 \text{ lb} (85 \text{ in}^3)}{981 \text{ in}^4(2 \times 2 \text{ in.})} = 151 \text{ psi} \]

**THE CORRECT ANSWER IS: (B)**

513. \[ M_S = (20 \text{ kips})(12 \text{ in.} - 5 \text{ in.}) = 140 \text{ in.-kips} \]

\[ N_S = 20 \text{ kips} \]

\[ \sigma_{\text{flexure}} = \frac{(140 \text{ in.-kips})(5 \text{ in.})}{90 \text{ in}^4} = 7.8 \text{ ksi} \]

\[ \sigma_{\text{axial}} = \frac{20 \text{ kips}}{7 \text{ in}^2} = 2.9 \text{ ksi} \]

Max compressive stress (at bottom):

\[ -7.8 \text{ ksi} + 2.9 \text{ ksi} = -4.9 \text{ ksi} \]

**THE CORRECT ANSWER IS: (B)**
514.  

\[ R_A = \frac{200 \text{ lb} \times 28 \text{ ft} + 125 \text{ lb} \times 16 \text{ ft}}{68 \text{ ft}} = 111.76 \text{ lb} \]

\[ R_D = \frac{200 \text{ lb} \times 40 \text{ ft} + 125 \text{ lb} \times 52 \text{ ft}}{68 \text{ ft}} = 213.24 \text{ lb} \]

\[ H_A = \frac{40 \text{ ft}}{1 \text{ ft}} \times R_A = 4,470.4 \text{ lb} \]

\[ H_A = H_D \]

\[ F_{CD} = \sqrt{213.24^2 + 4,470.4^2} \]

\[ F_{CD} = 4,475.5 \text{ lb} \]

THE CORRECT ANSWER IS: (B)

515.  

\[ r_{EW} = r_{NS} \quad K_{EW} > K_{NS} \quad \text{Buckling in east-west direction will control.} \]

THE CORRECT ANSWER IS: (B)

516.  

ACI 318-14, Tables 19.3.1.1, 19.3.2.1, and 19.3.3.1 give 4.5%. Neglect tolerance per problem statement.

\[ \therefore \text{ minimum} = 4.5\% \]

THE CORRECT ANSWER IS: (A)

517.  

Concrete reaches ultimate strain and fails prior to steel yielding. Failure is sudden without warning (brittle failure).

THE CORRECT ANSWER IS: (D)