

# National Council of Examiners for Engineering and Surveying (NCEES) Fundamentals of Engineering (FE) Civil Practice Exam (Sample)

Study Guide



BY EXAMZIFY

**Everything you need from our exam experts!**

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# Table of Contents

<b>Copyright</b> .....	<b>1</b>
<b>Table of Contents</b> .....	<b>2</b>
<b>Introduction</b> .....	<b>3</b>
<b>How to Use This Guide</b> .....	<b>4</b>
<b>Questions</b> .....	<b>5</b>
<b>Answers</b> .....	<b>8</b>
<b>Explanations</b> .....	<b>10</b>
<b>Next Steps</b> .....	<b>16</b>

SAMPLE

# Introduction

Preparing for a certification exam can feel overwhelming, but with the right tools, it becomes an opportunity to build confidence, sharpen your skills, and move one step closer to your goals. At Examzify, we believe that effective exam preparation isn't just about memorization, it's about understanding the material, identifying knowledge gaps, and building the test-taking strategies that lead to success.

This guide was designed to help you do exactly that.

Whether you're preparing for a licensing exam, professional certification, or entry-level qualification, this book offers structured practice to reinforce key concepts. You'll find a wide range of multiple-choice questions, each followed by clear explanations to help you understand not just the right answer, but why it's correct.

The content in this guide is based on real-world exam objectives and aligned with the types of questions and topics commonly found on official tests. It's ideal for learners who want to:

- Practice answering questions under realistic conditions,
- Improve accuracy and speed,
- Review explanations to strengthen weak areas, and
- Approach the exam with greater confidence.

We recommend using this book not as a stand-alone study tool, but alongside other resources like flashcards, textbooks, or hands-on training. For best results, we recommend working through each question, reflecting on the explanation provided, and revisiting the topics that challenge you most.

Remember: successful test preparation isn't about getting every question right the first time, it's about learning from your mistakes and improving over time. Stay focused, trust the process, and know that every page you turn brings you closer to success.

Let's begin.

# How to Use This Guide

**This guide is designed to help you study more effectively and approach your exam with confidence. Whether you're reviewing for the first time or doing a final refresh, here's how to get the most out of your Examzify study guide:**

## 1. Start with a Diagnostic Review

**Skim through the questions to get a sense of what you know and what you need to focus on. Your goal is to identify knowledge gaps early.**

## 2. Study in Short, Focused Sessions

**Break your study time into manageable blocks (e.g. 30 - 45 minutes). Review a handful of questions, reflect on the explanations.**

## 3. Learn from the Explanations

**After answering a question, always read the explanation, even if you got it right. It reinforces key points, corrects misunderstandings, and teaches subtle distinctions between similar answers.**

## 4. Track Your Progress

**Use bookmarks or notes (if reading digitally) to mark difficult questions. Revisit these regularly and track improvements over time.**

## 5. Simulate the Real Exam

**Once you're comfortable, try taking a full set of questions without pausing. Set a timer and simulate test-day conditions to build confidence and time management skills.**

## 6. Repeat and Review

**Don't just study once, repetition builds retention. Re-attempt questions after a few days and revisit explanations to reinforce learning. Pair this guide with other Examzify tools like flashcards, and digital practice tests to strengthen your preparation across formats.**

**There's no single right way to study, but consistent, thoughtful effort always wins. Use this guide flexibly, adapt the tips above to fit your pace and learning style. You've got this!**

## **Questions**

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- 1. What does bearing refer to in surveying?**
  - A. The distance to a specific point**
  - B. The angle made with the vertical line**
  - C. The quadrant and angle of a line related to the meridian**
  - D. The curvature of the earth's surface**
  
- 2. What type of ions cause hardness in water?**
  - A. Single positive ions**
  - B. Multi-positive ions**
  - C. Neutral ions**
  - D. Negative ions**
  
- 3. What is meant by Estimate at Completion (EAC)?**
  - A. The predicted finish date of the project**
  - B. The forecasted total cost to complete the project**
  - C. The amount spent on project resources**
  - D. The initial project budget estimate**
  
- 4. What defines a meridian on a map?**
  - A. An arc between two points**
  - B. A horizontal line across the map**
  - C. An arc drawn between the North and South poles**
  - D. A circle around the equator**
  
- 5. Which type of soil is most likely to require a Falling Head Test for permeability determination?**
  - A. Coarse-grained soils**
  - B. Fine-grained soils**
  - C. Well-graded soils**
  - D. Poorly graded soils**
  
- 6. What is defined as any additional loading applied externally to the soil?**
  - A. Active earth pressure**
  - B. Passive earth pressure**
  - C. Surcharge**
  - D. Excavation**

**7. Permeability is an indication of what property in soil?**

- A. The ability to store water**
- B. The measure of contiguous voids for water flow**
- C. The compressibility of the soil**
- D. The bonding strength between soil particles**

**8. What does "coplanar" refer to in the context of vector forces?**

- A. Three-dimensional forces acting together**
- B. Vector forces acting in the same plane**
- C. Forces that are perpendicular to each other**
- D. Non-parallel vector forces in different planes**

**9. What does it mean if a water treatment process has high Free Chlorine Residuals?**

- A. It indicates effective disinfection has occurred**
- B. It signifies incomplete treatment of the water**
- C. It suggests the water is unsafe for consumption**
- D. It means disinfection by-products are minimal**

**10. What is the result of angular deformation caused by shear stress?**

- A. Normal Strain**
- B. Shear Strain**
- C. Compressive Strain**
- D. Tensile Strain**

## **Answers**

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1. C
2. B
3. B
4. C
5. B
6. C
7. B
8. B
9. A
10. B

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## **Explanations**

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## 1. What does bearing refer to in surveying?

- A. The distance to a specific point
- B. The angle made with the vertical line
- C. The quadrant and angle of a line related to the meridian**
- D. The curvature of the earth's surface

In surveying, bearing is defined as the direction or angle of a line with respect to a meridian, which is typically either true north or magnetic north. This means that the correct answer emphasizes the relationship between the directional line being measured and the established north direction used as a reference. Bearing can be expressed in degrees, minutes, and seconds or in cardinal directions (such as N, S, E, W) combined with an angle (for example, N 30° E). This system allows surveyors to communicate precise direction and orientation of points relative to the earth's coordinate system, which is essential for accurate mapping, construction, and land development. The other options do not accurately describe the definition of bearing in surveying. The distance to a specific point relates to measurement rather than orientation. The angle made with the vertical line describes a different aspect of geometry, often referred to as slope or inclination, not bearing. The curvature of the earth's surface pertains to geodesy and adjustments for large scale surveys but does not define bearing itself. Thus, understanding bearing as a means of indicating direction and reference to a meridian is crucial in surveying practices.

## 2. What type of ions cause hardness in water?

- A. Single positive ions
- B. Multi-positive ions**
- C. Neutral ions
- D. Negative ions

Hardness in water is primarily caused by the presence of multi-positive ions, specifically divalent cations such as calcium ( $\text{Ca}^{2+}$ ) and magnesium ( $\text{Mg}^{2+}$ ). These ions contribute to the ionic composition of water, leading to the formation of insoluble salts when they react with bicarbonates or sulfates that are also present. The more of these divalent ions present in the water, the greater the hardness, which can affect water quality, soap effectiveness, and scale formation in plumbing systems. In contrast, single positive ions, neutral ions, and negative ions do not significantly contribute to water hardness. Single positive ions, like sodium ( $\text{Na}^+$ ) or potassium ( $\text{K}^+$ ), do not have the same dual charge and hence do not precipitate in the same manner as the multi-positive ions do. Neutral ions lack any charge and consequently do not participate in the reactions that determine water hardness. Negative ions, such as chloride ( $\text{Cl}^-$ ) or sulfate ( $\text{SO}_4^{2-}$ ), can interact with cations in water but do not themselves contribute to hardness; rather, they can influence solubility aspects and the overall ionic balance of the water. Thus, the correct choice highlights the significance of multi-positive ions

### 3. What is meant by Estimate at Completion (EAC)?

- A. The predicted finish date of the project
- B. The forecasted total cost to complete the project**
- C. The amount spent on project resources
- D. The initial project budget estimate

Estimate at Completion (EAC) refers to the forecasted total cost that is expected to be incurred to complete a project. It is a crucial metric in project management, particularly in the field of engineering and construction, as it helps project managers assess the overall financial health and performance of a project as it progresses. EAC takes into account the actual costs incurred to date and the remaining work that needs to be completed, providing a comprehensive estimate of the total expenditure required to finish the project. This estimation is essential for keeping the project on budget and for making informed decisions about resource allocation, risk management, and potential changes in project scope. Understanding EAC allows project managers to identify variances between actual performance and planned performance, which can prompt necessary adjustments to project plans and budgets. By focusing on effectively estimating the total cost to complete a project, EAC plays a vital role in enhancing transparency and accountability throughout the project lifecycle.

### 4. What defines a meridian on a map?

- A. An arc between two points
- B. A horizontal line across the map
- C. An arc drawn between the North and South poles**
- D. A circle around the equator

A meridian on a map is defined as an arc drawn between the North and South poles. This line represents a line of longitude, which is essential for locating geographical positions on Earth. Meridians are perpendicular to the equator and run from pole to pole, connecting points of equal longitude. Each meridian is defined by an angular measurement, with the prime meridian at 0 degrees longitude serving as the reference point. The concept of a meridian is fundamental to the grid system used in mapping and navigation, where the position of any point on Earth's surface can be described using both latitude (which runs parallel to the equator) and longitude (which consists of meridians). Understanding meridians is critical for various applications in civil engineering, such as land surveying, mapping, and GPS technology.

**5. Which type of soil is most likely to require a Falling Head Test for permeability determination?**

- A. Coarse-grained soils**
- B. Fine-grained soils**
- C. Well-graded soils**
- D. Poorly graded soils**

The Falling Head Test is typically used for fine-grained soils when determining permeability. This method's effectiveness arises from its ability to measure the permeability of soils that have low hydraulic conductivity, which is characteristic of fine-grained soils such as silts and clays. Fine-grained soils can retain moisture and exhibit lower permeability due to their smaller particle sizes and greater surface area, which affects how water flows through them. The Falling Head Test applies a small hydraulic gradient, minimizing disturbances to the soil structure, and allows for accurate measurement of the very slow flow rates typical of these soils. By comparison, coarse-grained soils, like sands and gravels, generally possess higher permeability and are more commonly tested using the Constant Head Test, which is more suited to their rapid flow characteristics. Well-graded and poorly graded soils can contain a variety of grain sizes; however, the finer particles predominantly define their permeability characteristics, making the Falling Head Test the preferred method for fine-grained soils.

**6. What is defined as any additional loading applied externally to the soil?**

- A. Active earth pressure**
- B. Passive earth pressure**
- C. Surcharge**
- D. Excavation**

The term that refers to any additional loading applied externally to the soil is surcharge. Surcharge is commonly understood in geotechnical engineering as an extra load added to the ground surface, which affects the soil stresses beneath that surface. This can arise from various sources, such as construction materials, structures, or any other weight placed on the soil, leading to increased soil stress and potential consolidation. Understanding surcharge is essential for predicting the behavior of soil under load, especially in the context of foundation design and earthwork projects. The effects of surcharge can influence settlement, stability, and overall performance of structures built on or near the affected soil. In design situations, engineers must consider the impact of surcharge on the existing soil conditions to ensure safety and functionality. Active and passive earth pressures relate to the lateral pressures exerted by soil on retaining structures and are not defined as external loads. Excavation involves the removal of soil, which may create changes in stress distribution but is not an external load applied to soil. Thus, the term surcharge correctly captures the concept of additional loading applied externally to the soil.

## 7. Permeability is an indication of what property in soil?

- A. The ability to store water
- B. The measure of contiguous voids for water flow**
- C. The compressibility of the soil
- D. The bonding strength between soil particles

Permeability in soil refers specifically to the ability of soil to allow water to flow through its voids. This property is fundamentally linked to the interconnectedness and size of those voids, which facilitates the movement of water. A higher permeability indicates a greater ease for water to flow through the soil due to a network of connected pores, enabling quick drainage or infiltration. In this context, the correct answer describes permeability as a measure of contiguous voids for water flow, highlighting the importance of the soil's internal structure in determining how easily water can penetrate and move through it. This property is critical in various applications, including drainage design, groundwater studies, and environmental assessments, as it affects how soil interacts with water. The ability to store water pertains more to soil retention capabilities, which is influenced by factors such as texture and structure but does not directly address the flow characteristics dictated by permeability. Similarly, compressibility relates to how much a soil can be compressed under load, and bonding strength between soil particles pertains to cohesion and the inter-particle forces, both of which are not measures of how well water can flow through the soil.

## 8. What does "coplanar" refer to in the context of vector forces?

- A. Three-dimensional forces acting together
- B. Vector forces acting in the same plane**
- C. Forces that are perpendicular to each other
- D. Non-parallel vector forces in different planes

In the context of vector forces, "coplanar" refers to vector forces that are all situated within the same plane. This means that if you were to visualize these forces, you could draw them on a flat surface without any of them extending above or below that surface. The concept of coplanarity is crucial in engineering and physics because it simplifies the analysis of force systems. When forces are coplanar, we can use methods such as vector addition in two dimensions to determine the resultant force and analyze equilibrium conditions effectively. Other options do not accurately describe the nature of coplanarity. For instance, describing forces as three-dimensional does not convey their availability within a single plane. Similarly, characterizing forces as perpendicular to each other or in different planes are aspects that imply a more complex relationship than what coplanar forces entail. Thus, the correct understanding here is the specificity of coplanar forces being those that reside within the same geometric plane.

## 9. What does it mean if a water treatment process has high Free Chlorine Residuals?

- A. It indicates effective disinfection has occurred**
- B. It signifies incomplete treatment of the water**
- C. It suggests the water is unsafe for consumption**
- D. It means disinfection by-products are minimal**

High Free Chlorine Residuals in a water treatment process indicate that effective disinfection has occurred. Free chlorine is a commonly used disinfectant in water treatment to eliminate harmful microorganisms. When chlorine is added to water, it reacts with pathogens, and if there is a noticeable residual of free chlorine remaining after the disinfection process, this is a strong indicator that sufficient chlorine was present to kill off pathogens effectively. Maintaining some level of free chlorine is essential for ongoing disinfection throughout the water distribution system, ensuring that any potential recontamination is also managed. Therefore, if the residual levels are high, it supports the conclusion that the treatment process has been effective in meeting its primary goal of disinfection. The context regarding what high free chlorine residuals do not indicate helps clarify their significance. For example, having high residuals does not signify incomplete treatment since effective disinfection implies adequate treatment. It also does not suggest that the water is unsafe; on the contrary, proper residual levels indicate safety. Lastly, while high chlorine levels can lead to disinfection by-products, it does not directly mean these by-products are minimal; other factors would need to be assessed to determine their presence.

## 10. What is the result of angular deformation caused by shear stress?

- A. Normal Strain**
- B. Shear Strain**
- C. Compressive Strain**
- D. Tensile Strain**

Shear strain is the result of angular deformation caused by shear stress. When a material is subjected to shear stress, it experiences a change in shape without a change in volume, effectively leading to a relative displacement of its layers. This deformation can be quantified by measuring the angle by which these layers have shifted from their original configuration. Unlike normal strain, which refers to elongation or shortening resulting from axial loads (tensile or compressive), shear strain specifically considers the angular change that occurs due to shear forces acting parallel to the surface. Shear stress is defined as the force per unit area applied in a direction parallel to the face of the material, and the resulting shear strain is a measure of how much the angle has changed from its original state. This distinction is crucial in structural analysis and design, as it helps engineers predict how materials will behave under various loading conditions.

# Next Steps

**Congratulations on reaching the final section of this guide. You've taken a meaningful step toward passing your certification exam and advancing your career.**

**As you continue preparing, remember that consistent practice, review, and self-reflection are key to success. Make time to revisit difficult topics, simulate exam conditions, and track your progress along the way.**

**If you need help, have suggestions, or want to share feedback, we'd love to hear from you. Reach out to our team at [hello@examzify.com](mailto:hello@examzify.com).**

**Or visit your dedicated course page for more study tools and resources:**

**<https://ncees-fundamentalsofengineeringcivil.examzify.com>**

**We wish you the very best on your exam journey. You've got this!**

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