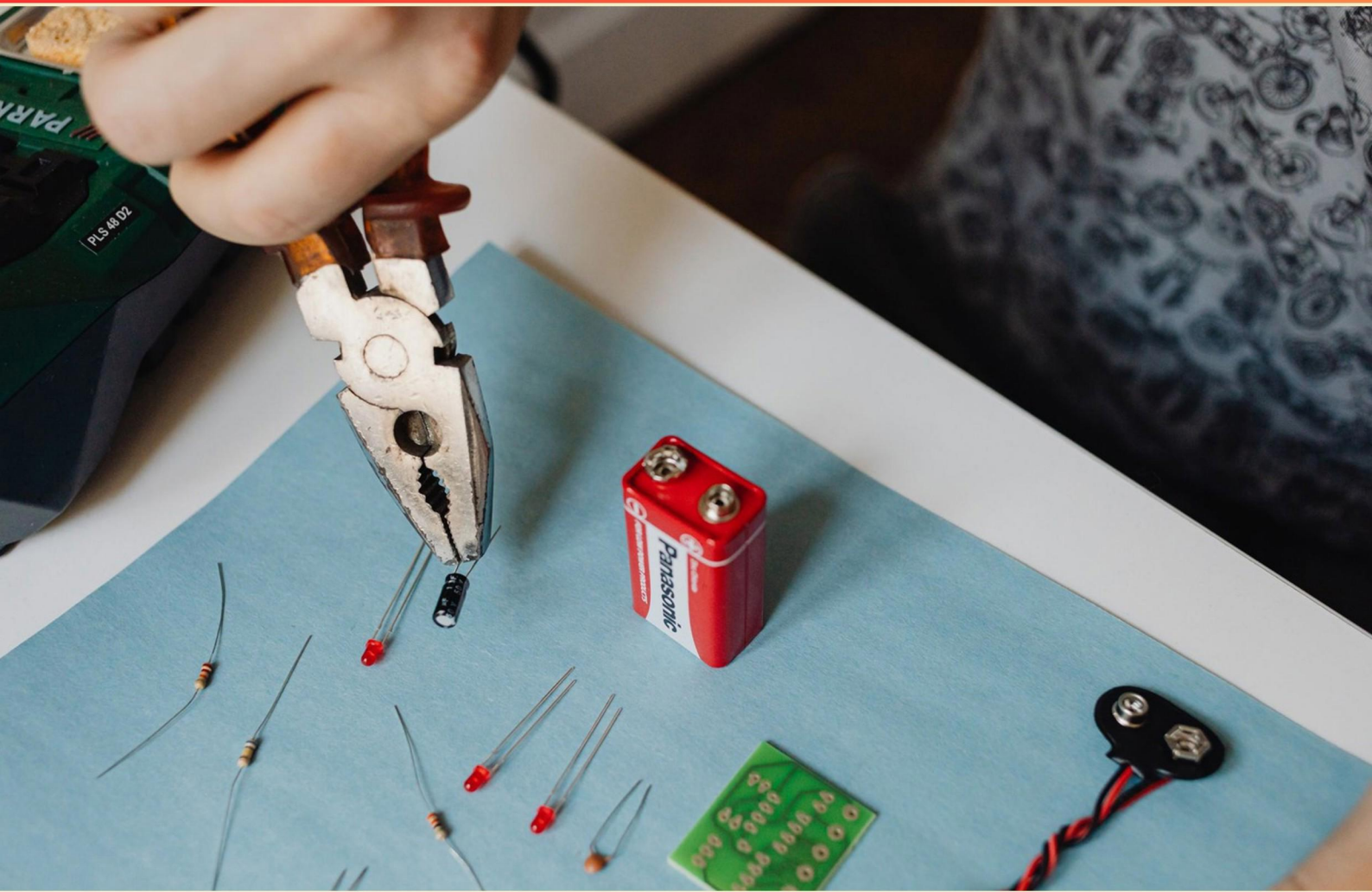


NATIONAL COUNCIL OF EXAMINERS FOR ENGINEERING AND SURVEYING (NCEES) FUNDAMENTALS OF ENGINEERING (FE) ELECTRICAL AND COMPUTER PRACTICE EXAM (SAMPLE) STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

**VISIT US ONLINE FOR
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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. In control systems, what does the term 'null' refer to?**
 - A. A point where the control signal is at its maximum
 - B. A condition where there is a significant error signal
 - C. A state where the control signal and process variable are equal
 - D. A point of minimal energy consumption
- 2. What role do sensors play in electrical systems?**
 - A. To amplify electrical signals
 - B. To detect physical conditions and convert them to measurable signals
 - C. To regulate power supply conditions
 - D. To store electrical energy
- 3. What length of a 60 Hz transmission line is classified as long?**
 - A. Up to 100 mi (160 km)
 - B. Up to 150 mi (240 km)
 - C. Greater than 150 mi (240 km)
 - D. Greater than 200 mi (320 km)
- 4. What type of circuit element stores electrical energy in an electric field?**
 - A. Resistor
 - B. Capacitor
 - C. Inductor
 - D. Transformer
- 5. What equation provides the equivalent capacitance for capacitors in series?**
 - A. $C_{eq} = C_1 + C_2 + \dots + C_n$
 - B. $C_{eq} = 1/[(1/C_1) + (1/C_2) + \dots + (1/C_n)]$
 - C. $C_{eq} = C_1 C_2 / (C_1 + C_2)$
 - D. $C_{eq} = n * C$
- 6. What is the main function of a digital-to-analog converter (DAC)?**
 - A. To convert analog signals into digital data
 - B. To amplify electrical signals in a circuit
 - C. To convert digital signals into analog voltages or currents
 - D. To store digital data in a physical format

- 7. Which of the following compounds conducts electricity when dissolved in water?**
- A. Solvent
 - B. Electrolyte
 - C. Solute
 - D. Nonelectrolyte
- 8. In a delta-connected source driving a delta-connected load, what can be said about the load voltage?**
- A. It varies with the load
 - B. It is equal to the source phase voltage
 - C. It is less than the line voltage
 - D. It equals the line voltage for a given phase
- 9. What is the key difference between synchronous and asynchronous counters?**
- A. Synchronous counters are faster than asynchronous counters
 - B. Synchronous counters have flip-flops triggered simultaneously by the clock signal
 - C. Asynchronous counters are more reliable than synchronous counters
 - D. Asynchronous counters can only count in binary
- 10. What unit of measure is used to indicate a battery cycle?**
- A. Volt
 - B. Watt-hour
 - C. Ampere-hour
 - D. Ohm

Answers

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

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Explanations

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1. In control systems, what does the term 'null' refer to?

- A. A point where the control signal is at its maximum
- B. A condition where there is a significant error signal
- C. A state where the control signal and process variable are equal**
- D. A point of minimal energy consumption

In control systems, the term 'null' signifies a state of balance where the control signal aligns with the process variable. This condition is crucial because it indicates that the system has reached a steady state, with no error signal present between the desired setpoint and the actual output. When the control signal and the process variable are equal, it means the system is effectively achieving its objective, and the control loop is stable. This is often seen in feedback control systems where maintaining equilibrium is essential for proper operation. Understanding this concept helps in designing control systems that are responsive and accurate. The other options do not capture this meaning: maximum control signal points pertain to the upper limits of system operation, significant error signals represent a divergence from the desired state, and points of minimal energy consumption do not directly relate to the core definition of 'null' in the context of control systems. Thus, recognizing the meaning of 'null' as a condition of equality between the control signal and the process variable is fundamental for engineers working in this field.

2. What role do sensors play in electrical systems?

- A. To amplify electrical signals
- B. To detect physical conditions and convert them to measurable signals**
- C. To regulate power supply conditions
- D. To store electrical energy

Sensors are crucial components in electrical systems because they are designed to detect physical conditions such as temperature, pressure, light, and motion, and convert these conditions into measurable signals, often electrical signals. This conversion allows for the monitoring and control of various processes and systems, enabling automation and feedback mechanisms. For example, a temperature sensor can detect the heat in an environment and output a corresponding voltage or current signal that indicates that temperature. This signal can then be processed by a control system to take necessary actions, such as turning on a heating or cooling unit. The ability to translate physical phenomena into electrical signals is foundational for many applications in fields such as automation, robotics, and process control. In contrast to other roles mentioned in the choices, amplifying electrical signals, regulating power supply conditions, and storing electrical energy reflect functions associated with amplifiers, voltage regulators, and capacitors or batteries, respectively. While these components are also essential in electrical systems, they serve different specific purposes that do not encompass the primary function of sensors.

3. What length of a 60 Hz transmission line is classified as long?

- A. Up to 100 mi (160 km)
- B. Up to 150 mi (240 km)
- C. Greater than 150 mi (240 km)**
- D. Greater than 200 mi (320 km)

In electrical engineering, the classification of transmission lines as short, medium, or long is primarily based on the length of the line relative to the wavelength of the signal being transmitted. For a frequency of 60 Hz, the wavelength is quite long, approximately 3,100 miles (or about 5,000 kilometers). A long transmission line is typically defined as one that is more than one-tenth of the wavelength of the operating frequency. Given the relatively low frequency of 60 Hz, any transmission line exceeding approximately 150 miles (240 km) would be classified as long. This distinction is important because long transmission lines exhibit different electrical characteristics, such as significant inductance and capacitance, which must be considered in their design and operation. Thus, the classification of greater than 150 miles (240 km) as long aligns with the common standards in electrical engineering and is critical for ensuring proper transmission line analysis and performance. This understanding helps engineers effectively design and manage long-distance power transmission systems.

4. What type of circuit element stores electrical energy in an electric field?

- A. Resistor
- B. Capacitor**
- C. Inductor
- D. Transformer

A capacitor is the circuit element that stores electrical energy in an electric field. It consists of two conductive plates separated by an insulating material known as a dielectric. When a voltage is applied across the plates, an electric field is created, causing positive charge to accumulate on one plate and negative charge on the other. This process allows the capacitor to store energy in the form of an electric field between the plates. The energy stored in a capacitor can be calculated using the formula $E = \frac{1}{2} CV^2$, where E is the stored energy, C is the capacitance, and V is the voltage across the plates. This characteristic makes capacitors essential components in various applications, including filtering, energy storage, and smoothing voltage fluctuations in power supply circuits. On the other hand, resistors dissipate energy as heat, inductors store energy in a magnetic field, and transformers transfer electrical energy between circuits through electromagnetic induction. While inductors also store energy, it is specifically in the form of a magnetic field, not an electric field like in capacitors. Therefore, the correct choice is the capacitor, as it distinctly defines the storage of electrical energy in an electric field.

5. What equation provides the equivalent capacitance for capacitors in series?

- A. $C_{eq} = C_1 + C_2 + \dots + C_n$
- B. $C_{eq} = 1/[(1/C_1) + (1/C_2) + \dots + (1/C_n)]$**
- C. $C_{eq} = C_1 C_2 / (C_1 + C_2)$
- D. $C_{eq} = n * C$

The equivalent capacitance for capacitors connected in series can be determined using the formula that involves the reciprocals of the individual capacitances. When capacitors are in series, the total capacitance decreases because the charge stored by each capacitor must be the same, while the voltage across each capacitor adds up. The equation presented reflects this series relationship. Specifically, the formula $1/C_{eq} = (1/C_1) + (1/C_2) + \dots + (1/C_n)$ means that the reciprocal of the equivalent capacitance (C_{eq}) is equal to the sum of the reciprocals of each individual capacitor's capacitance. This is due to the way voltage divides among capacitors in series: each capacitor has an individual voltage drop that contributes to the total voltage across the series combination. As a result, when capacitors are added in series, the system behaves such that the total capacitance is always less than the smallest individual capacitor in the series. This behavior is distinctly different from capacitors connected in parallel, where capacitances add directly. Understanding this fundamental distinction is crucial in circuit design and analysis involving capacitors.

6. What is the main function of a digital-to-analog converter (DAC)?

- A. To convert analog signals into digital data
- B. To amplify electrical signals in a circuit
- C. To convert digital signals into analog voltages or currents**
- D. To store digital data in a physical format

The main function of a digital-to-analog converter (DAC) is indeed to convert digital signals into analog voltages or currents. In many electronic applications, information is often represented in digital form (using binary data), such as in microcontrollers and digital processors. However, many devices, such as speakers, analog sensors, and other types of outputs, operate in the analog domain. The DAC bridges the gap between these two domains by translating the digital signal into a continuous analog output. This process involves the DAC interpreting the binary data and outputting a corresponding voltage or current that represents that data in a form that can drive devices or display information in a human-readable way. For example, in audio applications, the DAC converts digital audio files into the analog signals needed to drive speakers, ensuring that sound reproduces accurately as intended. In contrast, the other options describe functions that are not performed by a DAC. The first option refers to the function of an analog-to-digital converter (ADC), which does the opposite of a DAC by converting analog signals into digital data. Amplification and storage of digital data pertain to functions of amplifiers and memory devices, respectively, further distinguishing them from the specific role and purpose of a digital-to-analog converter.

7. Which of the following compounds conducts electricity when dissolved in water?

- A. Solvent
- B. Electrolyte**
- C. Solute
- D. Nonelectrolyte

The correct answer is the compound classified as an electrolyte. An electrolyte is a substance that, when dissolved in water, dissociates into ions, which are charged particles that enable the solution to conduct electricity. This ionic dissociation is essential for electrical conductivity, as the movement of these ions through the solution allows for the flow of electric current. Electrolytes are typically salts, acids, or bases that free up ions in solution. For example, when sodium chloride (table salt) dissolves in water, it breaks apart into sodium ions (Na⁺) and chloride ions (Cl⁻), which can then move freely in the solution, facilitating electrical conduction. In contrast, solvents such as water are typically the medium in which solutes dissolve but do not themselves contribute to electrical conductivity in terms of ion movement. Solutes can be any substance that is dissolved in a solvent, which can include electrolytes, but not all solutes are electrolytes. Nonelectrolytes, like sugars, do not dissociate into ions in solution, and thus do not conduct electricity. Their molecular structure does not allow for the free movement of charged particles.

8. In a delta-connected source driving a delta-connected load, what can be said about the load voltage?

- A. It varies with the load
- B. It is equal to the source phase voltage
- C. It is less than the line voltage
- D. It equals the line voltage for a given phase**

In a delta-connected source driving a delta-connected load, the load voltage relates to the line voltage in a specific way due to the properties of delta connections. In this configuration, each load is connected directly across the lines where the line voltage is present, which means the voltage across each load element is equal to the line voltage for that phase. In a delta connection, the voltage across each load element (phase voltage) is the same as the line voltage that connects them. Since each load in the delta configuration is across two phases of the supply, it receives the full line voltage. Consequently, this results in the load voltage being equivalent to the line voltage for that specific phase, maintaining a direct relationship. This is fundamental in three-phase systems and illustrates the efficient distribution of voltage and current in such configurations. Thus, understanding the relationship between line and load voltages in delta connections is crucial for correctly analyzing three-phase systems.

9. What is the key difference between synchronous and asynchronous counters?

- A. Synchronous counters are faster than asynchronous counters
- B. Synchronous counters have flip-flops triggered simultaneously by the clock signal**
- C. Asynchronous counters are more reliable than synchronous counters
- D. Asynchronous counters can only count in binary

The key distinction between synchronous and asynchronous counters lies in the triggering of the flip-flops used in their design. In synchronous counters, all flip-flops are triggered simultaneously by a common clock signal. This means that every flip-flop changes its state at the same moment, allowing for precise control and consistent timing throughout the entire circuit. The synchronous nature minimizes the propagation delay that can occur in designs where flip-flops are triggered at different times. On the other hand, asynchronous counters, also known as ripple counters, trigger their flip-flops in sequence. The output of one flip-flop triggers the next, which can lead to increased delay as the change in state ripples through the circuit. This can impact the overall speed and reliability of the counter, particularly at higher frequencies or in more complex circuits. Other options present valid points but do not encapsulate the foundational difference like the characteristic of simultaneous triggering in synchronous counters. While speed and reliability may indeed vary between these two types of counters, the simultaneous triggering of all flip-flops in synchronous design is what fundamentally distinguishes it.

10. What unit of measure is used to indicate a battery cycle?

- A. Volt
- B. Watt-hour
- C. Ampere-hour**
- D. Ohm

The appropriate unit of measure used to indicate a battery cycle is the ampere-hour. This unit quantifies the total electric charge a battery can deliver over time. Specifically, one ampere-hour represents the ability to provide one ampere of current for one hour. Battery cycles often refer to the charging and discharging processes that a battery undergoes, and the capacity of a battery is typically expressed in ampere-hours, reflecting how long it can power a device at a specified current. Thus, for understanding battery performance and longevity, ampere-hours are a critical measure helping to assess how many cycles a battery can effectively fulfill its capacity before its performance declines.

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.

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

<https://ncees-fe-electricalandcomputer.examzify.com>

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

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