

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

## Study Guide



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

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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

- 1. For what purpose is a zener diode primarily used?**
  - A. For signal amplification**
  - B. For rectifying AC current**
  - C. For voltage regulation**
  - D. For switching applications**
- 2. What does PID stand for in control systems?**
  - A. Proportional-Integral-Derivative**
  - B. Process-Input-Derivative**
  - C. Proportional-Independent-Derivative**
  - D. Process-Integral-Dynamic**
- 3. Which aspect of a Nyquist diagram is crucial for determining system stability?**
  - A. Phase shift**
  - B. Gain margins**
  - C. Frequency of oscillation**
  - D. Time constant**
- 4. What term describes any faults that are not three-phase symmetrical faults?**
  - A. Symmetrical faults**
  - B. Asymmetrical faults**
  - C. Phase faults**
  - D. Operational faults**
- 5. When discussing signal transmission, what does 'bandwidth' refer to?**
  - A. The maximum amplitude a signal can reach**
  - B. The number of bits per second transmitted**
  - C. The range of frequencies that can be transmitted by a channel**
  - D. The strength of the signal at its highest frequency**

- 6. What is one key assumption of the Nyquist theorem?**
- A. Systems are always linear**
  - B. Signals are always periodic**
  - C. Sampling must occur at discrete intervals**
  - D. Real-time processing is preferred**
- 7. What is the purpose of a Nyquist diagram?**
- A. To represent the time response of a system**
  - B. To plot the gain of a system over time**
  - C. To represent the frequency response of a control system**
  - D. To illustrate the circuit layout of a control system**
- 8. How is the term 'hysteresis' defined in control systems?**
- A. As the random fluctuation in output**
  - B. As the lag between input and output, influenced by past states**
  - C. As the immediate reaction of output to new input**
  - D. As the change in input due to system error**
- 9. What does a Fourier series represent?**
- A. A non-periodic function as a sum of exponential terms**
  - B. A periodic function as a sum of sine and cosine functions**
  - C. A frequency response of a digital signal**
  - D. A time-domain analysis of a signal**
- 10. What is a Printed Circuit Board (PCB) primarily used for?**
- A. Storing electrical energy**
  - B. Transmitting signals between devices**
  - C. Connecting and supporting electrical components**
  - D. Cooling electronic devices**



## **Answers**

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

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## **Explanations**

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## 1. For what purpose is a zener diode primarily used?

- A. For signal amplification
- B. For rectifying AC current
- C. For voltage regulation**
- D. For switching applications

A zener diode is primarily utilized for voltage regulation due to its unique ability to maintain a constant output voltage across a range of input voltages and load conditions. When the reverse voltage applied across a zener diode exceeds its specified breakdown voltage, the diode enters the breakdown region and conducts current, effectively clamping the output voltage to the desired level. This property makes it ideal for regulating voltage in power supply circuits, ensuring that sensitive electronic components receive a stable voltage even when there are fluctuations in input voltage or load. In contrast, while signal amplification, rectifying AC current, and switching applications are important functions of other types of diodes and electronic components, they do not leverage the special characteristics of a zener diode in the same way that voltage regulation does. Signal amplification typically requires active components like transistors, rectifying AC current pertains to the operation of regular diodes in converting alternating current to direct current, and switching applications often involve using diodes in on-off scenarios that exploit their fast switching characteristics rather than their voltage stabilization capabilities.

## 2. What does PID stand for in control systems?

- A. Proportional-Integral-Derivative**
- B. Process-Input-Derivative
- C. Proportional-Independent-Derivative
- D. Process-Integral-Dynamic

In control systems, PID stands for Proportional-Integral-Derivative. This term refers to a type of controller that combines three fundamental control actions to improve the stability and performance of a control system. The proportional component reacts to the current error, which is the difference between the desired setpoint and the measured process variable. It provides an immediate response based on the magnitude of that error. The integral component addresses any accumulated past errors, effectively eliminating the residual steady-state error that can occur if only proportional control is used. Finally, the derivative component predicts future errors based on the rate of change of the error, which helps to dampen the system's response and reduce overshoot, leading to a more stable control performance. In summary, the involvement of all three components—proportional, integral, and derivative—enables the PID controller to adjust its output in a manner that can effectively manage complex systems requiring precise control. Each component plays a critical role in achieving both stability and responsiveness in automation and control applications.

**3. Which aspect of a Nyquist diagram is crucial for determining system stability?**

- A. Phase shift
- B. Gain margins**
- C. Frequency of oscillation
- D. Time constant

In the context of control systems and stability analysis, gain margins play a pivotal role in determining system stability when using a Nyquist diagram. The Nyquist plot is a graphical representation of a system's frequency response, showing the complex gain (magnitude and phase) of the system over a range of frequencies. Gain margin specifically measures how much the gain of a system can increase before it becomes unstable. It is defined at the frequency where the phase angle of the open-loop transfer function reaches  $-180$  degrees (or equivalently,  $-\pi$  radians). At this critical point, adding unity gain (a gain of 1) would lead to the system crossing the imaginary axis in the Nyquist plot, resulting in instability. A positive gain margin indicates that there is a buffer before instability occurs, meaning the system can tolerate some increase in gain while remaining stable. Conversely, a negative gain margin implies imminent instability. While elements like phase shift and time constants are important in understanding transient responses and the dynamical behavior of systems, they do not directly inform the stability criteria as effectively as gain margins do in the frequency domain analysis. The frequency of oscillation is relevant for understanding the oscillatory modes of a system but does not provide a direct measurement of how close the system is

**4. What term describes any faults that are not three-phase symmetrical faults?**

- A. Symmetrical faults
- B. Asymmetrical faults**
- C. Phase faults
- D. Operational faults

The term that describes any faults that are not three-phase symmetrical faults is asymmetrical faults. In power systems, faults can be categorized based on their characteristics. A symmetrical fault involves all three phases being equally affected, such as a three-phase short circuit, where the electrical parameters remain balanced throughout. On the other hand, asymmetrical faults, also known as unsymmetrical faults, occur when the fault affects the system in a way that does not maintain this balance. Common examples of asymmetrical faults include line-to-ground faults, line-to-line faults, and double line-to-ground faults, which disturb the balance among the three phases. Understanding these distinctions is crucial for engineers involved in designing and analyzing electrical systems since asymmetrical faults can lead to different protection strategies and behaviors in the system compared to symmetrical faults.

5. When discussing signal transmission, what does 'bandwidth' refer to?
- A. The maximum amplitude a signal can reach
  - B. The number of bits per second transmitted
  - C. The range of frequencies that can be transmitted by a channel**
  - D. The strength of the signal at its highest frequency

Bandwidth refers to the range of frequencies that can be transmitted by a channel. It is a crucial concept in signal transmission as it determines the amount of data that can be sent over a communication medium within a given time frame. In practical terms, bandwidth indicates the difference between the highest and lowest frequency signals that a channel can effectively carry, which impacts the speed and quality of the data transmission. When a channel has a wider bandwidth, it can transmit a greater variety of frequencies, allowing for the transmission of more data or higher quality signals. For instance, in telecommunications and networking, a higher bandwidth typically results in faster data rates. Consequently, understanding bandwidth is essential for engineers when designing systems for effective communication and data transfer.

6. What is one key assumption of the Nyquist theorem?
- A. Systems are always linear
  - B. Signals are always periodic
  - C. Sampling must occur at discrete intervals**
  - D. Real-time processing is preferred

The Nyquist theorem is a fundamental principle in the field of signal processing, particularly when it comes to the sampling of continuous signals. One crucial assumption of the Nyquist theorem is that sampling must occur at discrete intervals. According to the theorem, to accurately reconstruct a signal from its samples without introducing errors (aliasing), it must be sampled at a rate that is at least twice the maximum frequency present in the signal. This means that the sampling process involves taking specific samples at regular time intervals, making discrete versions of the continuous signal. This practice of discrete sampling allows engineers and scientists to convert analog signals into a digital format, which is essential for digital signal processing and communication systems. By ensuring that the sampling rate meets the Nyquist criterion, the integrity of the signal can be preserved when it is later reconstructed. This is a critical concept for professionals in electrical and computer engineering, as it underpins much of the work in systems that involve signal processing and data transmission.

## 7. What is the purpose of a Nyquist diagram?

- A. To represent the time response of a system
- B. To plot the gain of a system over time
- C. To represent the frequency response of a control system**
- D. To illustrate the circuit layout of a control system

A Nyquist diagram is fundamentally used to represent the frequency response of a control system. It depicts how a system responds to different frequencies of input signals, providing insights into the stability and performance of the system. The diagram plots the complex gain (magnitude and phase) of the system over a range of frequencies, usually on a polar or Cartesian coordinate system. This representation is crucial because it allows engineers to assess various key factors such as stability margins, resonance peaks, and the overall response characteristics of the system as it reacts to sinusoidal inputs. By analyzing the shape and behavior of the curves on the Nyquist diagram, one can determine how changes in system parameters will affect the stability and performance of the control system being studied. The other options refer to different analyses related to control systems but do not pertain specifically to frequency response. For example, time response analysis focuses on how the system behaves over time, rather than in terms of frequency.

## 8. How is the term 'hysteresis' defined in control systems?

- A. As the random fluctuation in output
- B. As the lag between input and output, influenced by past states**
- C. As the immediate reaction of output to new input
- D. As the change in input due to system error

The term 'hysteresis' in control systems refers to the phenomenon where the output of a system depends not only on the current input but also on the history of past inputs or states. This lag between input and output means that there exists a differential response depending on whether the input is increasing or decreasing. In practical terms, hysteresis can manifest as a kind of "memory" in the system, where the output state is affected by how the system was previously operated. For example, in a temperature control system, a thermostat may turn on the heating when the temperature falls below a certain threshold but might not turn off immediately when the temperature reaches that threshold—this delay is influenced by the system's past states, as it resists changes to prevent constant switching. The other choices describe different concepts unrelated to hysteresis. Random fluctuations are indicative of noise or disturbances, immediate output reactions reflect a direct response without any lag, and changes in input due to system error are typically associated with feedback mechanisms rather than hysteresis. Understanding hysteresis is key in designing control systems that behave predictably despite their past conditions.

## 9. What does a Fourier series represent?

- A. A non-periodic function as a sum of exponential terms
- B. A periodic function as a sum of sine and cosine functions**
- C. A frequency response of a digital signal
- D. A time-domain analysis of a signal

A Fourier series represents a periodic function as a sum of sine and cosine functions. This mathematical tool allows for the decomposition of complex periodic signals into simpler components, specifically the sine and cosine functions, which are well-defined and have known properties. By expressing a periodic function in this manner, it becomes easier to analyze and manipulate, particularly in the context of signal processing and systems analysis. The periodic nature of the Fourier series is essential; it is fundamentally designed to represent functions that repeat over intervals. Each sine and cosine term corresponds to a specific frequency component of the original periodic signal. This is particularly useful in various applications, including electrical engineering, where understanding the frequency components of signals is crucial for the design and analysis of systems. The other concepts presented in the options focus on different aspects of signal representation but do not align with the fundamental purpose of a Fourier series. Non-periodic functions, for instance, are typically represented by Fourier transforms rather than series. Similarly, frequency response and time-domain analyses concern different frameworks for understanding signals, separate from the core concept of composing periodic functions with sine and cosine components.

## 10. What is a Printed Circuit Board (PCB) primarily used for?

- A. Storing electrical energy
- B. Transmitting signals between devices
- C. Connecting and supporting electrical components**
- D. Cooling electronic devices

A Printed Circuit Board (PCB) is primarily used for connecting and supporting electrical components. This is crucial in electronic design and manufacturing, as the PCB provides a physical substrate where various electronic components, such as resistors, capacitors, diodes, and integrated circuits, can be mounted. The conductive pathways etched or printed onto the board facilitate the electrical connections between these components, allowing them to communicate and function as part of a larger electronic system. Using a PCB enhances the reliability and robustness of electronic devices by providing a stable platform that minimizes the movement of components and reduces the risk of short circuits. The design of a PCB allows for efficient layout and routing of electrical connections, which helps in managing signal integrity and minimizing interference among components. In contrast, while options related to storing electrical energy, transmitting signals, and cooling electronic devices address important aspects of electronic systems, they do not adequately define the primary purpose of a PCB. Storing electrical energy is typically associated with capacitors or batteries, signal transmission pertains more to communication protocols, and cooling devices is handled by thermal management solutions like heatsinks or fans. Thus, the primary function of a PCB is centered around the integration of electronic components and establishing necessary connections for circuit functionality.



## 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-fe-electricalandcomputer.examzify.com>**

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