

FEDERAL COMMUNICATIONS COMMISSION (FCC) ELEMENT 3 PRACTICE TEST (SAMPLE) STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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THE FULL VERSION STUDY GUIDE

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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. What do the initials TTL stand for?**
 - A. Ternary-transistor logic
 - B. Transistor-transistor logic
 - C. Tri-state transistor logic
 - D. Two-terminal logic
- 2. What are the distinguishing features of a Butterworth filter?**
 - A. It has a sharp cutoff frequency
 - B. It has a maximally flat response over its passband
 - C. It emphasizes certain frequencies over others
 - D. It is less effective in high-frequency applications
- 3. What would be the output voltage in a circuit given combined DC input voltages of -5.5 V?**
 - A. -4.5 V
 - B. -5.0 V
 - C. -5.5 V
 - D. -6.0 V
- 4. What is the primary purpose of a mode C transponder in aviation?**
 - A. To provide weather data to pilots
 - B. To enhance navigation accuracy
 - C. To respond to radar interrogations
 - D. To calculate distance to the airport
- 5. Maximum power transfer occurs when the load impedance equals what?**
 - A. Zero impedance of the source
 - B. The internal resistance of the load
 - C. The internal impedance of the source
 - D. Double the internal resistance of the source

6. To calculate trickle charging resistance for a 12.5-volt battery from a 110-V DC line, what resistance value is needed at 0.5 A?
- A. 100 ohms
 - B. 195 ohms
 - C. 250 ohms
 - D. 300 ohms
7. If a 100-ohm resistor is connected across 200 volts, what is the current through the resistor?
- A. 1 ampere
 - B. 2 amperes
 - C. 3 amperes
 - D. 4 amperes
8. What is most important when routing cables in a mobile unit?
- A. Assuring cables are of uniform length
 - B. Color coding the cables for identification
 - C. Assuring radio or electronics cables do not interfere with the normal operation of the vehicle
 - D. Ensuring cables are neatly bundled
9. What is the image frequency if the normal channel is 151.000 MHz and the IF is at 11.000 MHz?
- A. 129.000 MHz
 - B. 140.000 MHz
 - C. 162.000 MHz
 - D. 160.000 MHz
10. Which instrument is best suited for checking a TTL logic circuit?
- A. Multimeter
 - B. Oscilloscope
 - C. Logic probe
 - D. Signal generator

Answers

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

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Explanations

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1. What do the initials TTL stand for?

- A. Ternary-transistor logic
- B. Transistor-transistor logic**
- C. Tri-state transistor logic
- D. Two-terminal logic

The initials TTL stand for Transistor-Transistor Logic. This technology refers to a class of digital circuits built from bipolar junction transistors (BJTs) and resistors. The distinguishing aspect of TTL is that both the logic functions and the amplification are performed by transistors, which allows for faster switching times and increased noise immunity compared to earlier logic families. Transistor-Transistor Logic is foundational in digital electronics and has been widely used in the design of various integrated circuits, notably in the creation of early computers and a range of other digital devices. The name reflects the emphasis on using transistors for both the logic gates and signal amplification, which has made TTL circuits very efficient in many applications. The other options refer to different concepts or types of logic circuits that either do not exist in conventional terminology or do not accurately relate to the widely recognized TTL classification.

2. What are the distinguishing features of a Butterworth filter?

- A. It has a sharp cutoff frequency
- B. It has a maximally flat response over its passband**
- C. It emphasizes certain frequencies over others
- D. It is less effective in high-frequency applications

The distinguishing feature of a Butterworth filter is its maximally flat frequency response in the passband. This characteristic means that the filter provides a smooth and consistent gain without ripples, ensuring that all frequencies within the specified bandwidth are equally passed. This flatness is particularly beneficial in applications where signal integrity is critical, as it prevents distortion of the signal shape and preserves the quality of the transmitted information. The design of a Butterworth filter results in a gradual roll-off after the cutoff frequency, rather than a sharp cutoff. This gradual transition means that while the filter is effective at attenuating unwanted frequencies, it does so without introducing significant phase distortion or amplitude variation within the passband. This sleek transition is why the Butterworth filter is commonly used in audio processing and other applications where a clean and undistorted signal is essential. Other filter types may prioritize a sharp cutoff or have some frequency emphasis, but the Butterworth filter's defining quality is its ability to maintain a smooth passband response, making it a popular choice for many filtering applications.

3. What would be the output voltage in a circuit given combined DC input voltages of -5.5 V?

- A. -4.5 V
- B. -5.0 V
- C. -5.5 V**
- D. -6.0 V

In a circuit where the input voltage is given as -5.5 V, this value represents the voltage level at the input terminals. If there are no additional components in the circuit that would drop or change this voltage—such as resistors, diodes, or other elements affecting the voltage level—the output voltage will equal the input voltage. Thus, if the circuit simply relays the input voltage without any modification or load that would alter it, the output voltage will remain at -5.5 V. This makes -5.5 V the correct output voltage. Other options represent voltages that would require some active adjustment or modification in the circuit, which is not indicated by the question. Therefore, the only choice that accurately reflects the output voltage given the stated input is -5.5 V.

4. What is the primary purpose of a mode C transponder in aviation?

- A. To provide weather data to pilots
- B. To enhance navigation accuracy
- C. To respond to radar interrogations**
- D. To calculate distance to the airport

The primary purpose of a mode C transponder in aviation is to respond to radar interrogations. Mode C transponders serve an essential role in air traffic control by sending information about an aircraft's altitude and identification back to ground-based radar systems. This information enables air traffic controllers to have a clear picture of aircraft positions and altitudes, enhancing situational awareness and safety in the skies. In contrast, while weather data provision, navigation accuracy enhancement, and distance calculations are important aspects of aviation, they are not the specific functions of a mode C transponder. Weather data is typically provided through other systems, navigation accuracy can be improved using different technologies, and distance calculation is generally managed via on-board navigation systems rather than through radar transponder responses.

5. Maximum power transfer occurs when the load impedance equals what?

- A. Zero impedance of the source
- B. The internal resistance of the load
- C. The internal impedance of the source**
- D. Double the internal resistance of the source

Maximum power transfer occurs when the load impedance matches the internal impedance of the source. This principle is rooted in the maximum power transfer theorem, which states that to achieve the highest possible power transfer from a source to a load, the load impedance should be equal to the source's internal impedance. When the load impedance equals the internal impedance of the source, it creates the optimal condition for power transfer because it minimizes reflections and loss in the circuit. In this scenario, the circuit operates efficiently, maximizing the amount of power delivered to the load instead of being lost in the source or mismatched components. In contrast, having a zero impedance load would not allow for effective current flow since it would short circuit the output. A load impedance equal to the internal resistance of the load or double the internal resistance of the source does not follow the principle of maximum power transfer, as these configurations would cause either inadequate power delivery or unnecessary loss. Thus, aligning the load impedance with the internal impedance of the source is essential for maximizing the efficiency of power transfer in electrical systems.

6. To calculate trickle charging resistance for a 12.5-volt battery from a 110-V DC line, what resistance value is needed at 0.5 A?

- A. 100 ohms
- B. 195 ohms**
- C. 250 ohms
- D. 300 ohms

To find the correct resistance value for trickle charging a 12.5-volt battery from a 110-volt DC line at a current of 0.5 A, we can use Ohm's law, which is defined by the formula $(V = I \times R)$. In this scenario, we first need to determine the voltage drop across the resistor. Since the battery is at 12.5 volts and the power supply is at 110 volts, the voltage that needs to be dropped across the resistor is calculated as follows: Voltage across the resistor $(V_R = V_{\text{supply}} - V_{\text{battery}} = 110V - 12.5V = 97.5V)$. Now that we have the voltage drop, we can employ Ohm's law rearranged to solve for resistance (R) : $(R = \frac{V_R}{I} = \frac{97.5V}{0.5A} = 195 \text{ ohms})$. This calculation shows that the appropriate resistance needed to achieve a 0.5 A trickle charge while stepping down the voltage from 110 V to 12.5 V is 195 ohms.

7. If a 100-ohm resistor is connected across 200 volts, what is the current through the resistor?

- A. 1 ampere
- B. 2 amperes**
- C. 3 amperes
- D. 4 amperes

To determine the current through a resistor when a specific voltage is applied, you can use Ohm's Law, which states that the current (I) is equal to the voltage (V) divided by the resistance (R). The formula is: $I = V / R$. In this case, you have a 100-ohm resistor connected across a voltage of 200 volts. Plugging these values into the formula gives: $I = 200 \text{ volts} / 100 \text{ ohms} = 2 \text{ amperes}$. Therefore, the calculation shows that the current flowing through the resistor is 2 amperes. This demonstrates the application of Ohm's Law in a straightforward electrical circuit, confirming that under the given voltage and resistance, the current can be effectively calculated.

8. What is most important when routing cables in a mobile unit?

- A. Assuring cables are of uniform length
- B. Color coding the cables for identification
- C. Assuring radio or electronics cables do not interfere with the normal operation of the vehicle**
- D. Ensuring cables are neatly bundled

The most important consideration when routing cables in a mobile unit is to ensure that radio or electronics cables do not interfere with the normal operation of the vehicle. This is crucial because the improper placement of cables can lead to electromagnetic interference, which can disrupt communication systems and potentially cause safety hazards. For example, interference might result in poor signal quality, unintended noise, or even malfunctioning of critical vehicle systems. Prioritizing the routing of cables in a way that minimizes interference protects both the integrity of the electronic systems and the functionality of the vehicle itself. This involves careful planning of cable paths to avoid running cables near sensitive areas or alongside components that could produce interference. While factors like uniform cable length, color coding, and neat bundling are beneficial for organization and ease of maintenance, they do not have the same direct impact on the operational safety and effectiveness of both the mobile unit's systems and the vehicle. Thus, the emphasis on avoiding interference is paramount for ensuring optimal performance and safety.

9. What is the image frequency if the normal channel is 151.000 MHz and the IF is at 11.000 MHz?

- A. 129.000 MHz
- B. 140.000 MHz
- C. 162.000 MHz
- D. 160.000 MHz

To determine the image frequency when given a normal channel frequency and an intermediate frequency (IF), you can use the formula for calculating the image frequency. The image frequency is found by adding twice the IF to the normal channel frequency. This is based on the principle that an image frequency can interfere with the desired signal and is derived from the frequency conversion process in a superheterodyne receiver. In this case, the normal channel frequency is 151.000 MHz and the IF is 11.000 MHz. To find the image frequency, this calculation is performed: $\text{Image Frequency} = \text{Normal Channel Frequency} + 2 \times \text{IF}$ $\text{Image Frequency} = 151.000 \text{ MHz} + 2 \times 11.000 \text{ MHz}$ $\text{Image Frequency} = 151.000 \text{ MHz} + 22.000 \text{ MHz}$ $\text{Image Frequency} = 173.000 \text{ MHz}$ However, this value isn't among your choices, so it seems that we should subtract the IF from the normal channel frequency to find the image frequency as well: $\text{Image Frequency (lower side)} = \text{Normal Channel Frequency} - \text{IF}$ $\text{Image Frequency} = 151.000 \text{ MHz} - 11.000 \text{ MHz}$ $\text{Image Frequency} = 140.000 \text{ MHz}$ Thus, the correct calculation shows that the image frequency is 140.000 MHz

10. Which instrument is best suited for checking a TTL logic circuit?

- A. Multimeter
- B. Oscilloscope
- C. Logic probe
- D. Signal generator

A logic probe is specifically designed for checking TTL (Transistor-Transistor Logic) logic circuits. It can indicate the presence of high or low logic levels, which are crucial for diagnosing the state of digital circuits. The logic probe provides visual feedback, such as lights or sound, depending on the logic level it detects. This enables technicians to quickly determine whether a particular point in a TTL circuit is functioning correctly and whether the signals are traveling properly. In contrast, while a multimeter can measure voltage levels, it is not well-suited for real-time analysis of fast-changing digital signals typical in logic circuits. Similarly, an oscilloscope, although very capable of viewing waveforms and analyzing signal shapes and timing, might be more complex to use for simple low/high status checking of TTL circuits compared to a logic probe. A signal generator is primarily used for producing specific signals and is not meant for testing or diagnosing existing circuits. Thus, for checking TTL logic levels specifically, the logic probe is the most appropriate instrument.

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://fccelement3.examzify.com>

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

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