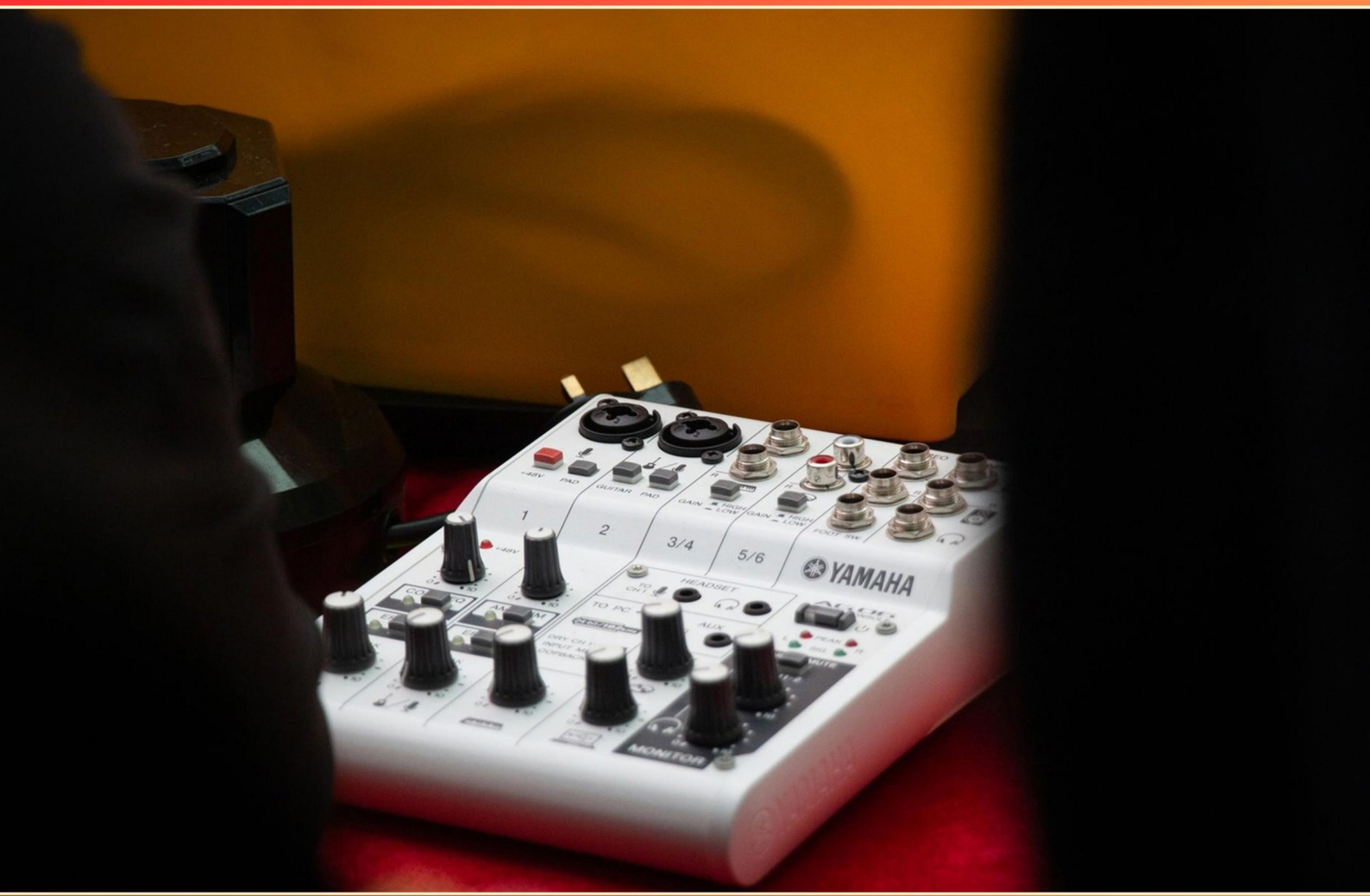
FCC GENERAL RADIOTELEPHONE OPERATOR LICENSE (GROL) ELEMENT 3 PRACTICE TEST (SAMPLE)

STUDY GUIDE



SAMPLE STUDY GUIDE WITH LIMITED QUESTIONS

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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.

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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!

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Questions

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1. How much gain should be used in the RF amplifier stage of a receiver?

A. Sufficient gain to overcome noise in the first mixer stage

B. It depends on the amplification factor of the first IF stage

C. As much gain as possible short of self oscillation

D. Sufficient gain to keep weak signals below the noise of the first mixer stage

2. What type of signals are used to conduct an SSB two-tone test?

A. Two audio signals of the same frequency, but shifted 90 degrees in phase.

B. Two non-harmonically related audio signals that are within the modulation band pass of the transmitter.

C. Two different audio frequency square wave signals of equal amplitude.

D. Any two audio frequencies as long as they are harmonically related.

3. An optoisolator is built using which two key components?

A. It uses magnetic coupling.

B. It uses light to transfer signals between input and output.

C. It uses acoustic coupling.

D. It uses direct electrical connection.

4. What is the magnitude of the impedance of a series network consisting of a 400-ohm resistor, a 600-ohm inductor reactance, and a 300-ohm capacitor reactance?

A. 400 Ω

B. 500 Ω

C. 600 Ω

D. 700 Ω

5. What is the description of an optocoupler?

A. A resistor and a capacitor

B. Two light sources modulated onto a mirrored surface

C. An LED and a photosensitive device

D. An amplitude modulated beam encoder

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6. Conductance takes place in a waveguide:

A. By interelectron delay

B. Through electrostatic field reluctance

C. In the same manner as a transmission line

D. Through electromagnetic and electrostatic fields in the walls of the waveguide

7. Which statement about Iridium satellites is true?

A. There are 48 satellites in orbit in 4 orbital planes.

B. The inclination of the orbital planes is 55 degrees.

C. There are 48 spot beams per satellite with a footprint of 30 miles in diameter.

D. The orbital period is approximately 85 minutes.

8. Which network configuration provides the most effective harmonic suppression?

A. Pi network

B. L-network

C. Pi-L network

D. Inverse L network

9. What occurs if the load is removed from an operating series DC motor?

A. It will stop running.

B. Speed will increase slightly.

C. No change occurs.

D. It will accelerate until it falls apart.

10. Which statement best describes spread-spectrum communication?

A. It varies the RF carrier according to a predetermined sequence

B. It uses a single narrowband carrier with simple modulation

C. It relies on high-power amplifiers

D. It minimizes bandwidth usage

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Answers

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

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Explanations

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1. How much gain should be used in the RF amplifier stage of a receiver?

A. Sufficient gain to overcome noise in the first mixer stage

B. It depends on the amplification factor of the first IF stage

C. As much gain as possible short of self oscillation

D. Sufficient gain to keep weak signals below the noise of the first mixer stage

Front-end gain is chosen to improve the signal-to-noise ratio by boosting the weak RF signal before it reaches the mixer. The first mixer contributes noise, so the RF amplifier should provide enough gain to raise the signal above that mixer noise floor, making the subsequent stages' processing more effective. If the RF stage is too weak, the mixer's own noise dominates and the SNR suffers; if it's driven too hard, you risk overload and distortion. The goal is to have just enough RF gain to overcome the mixer's noise contribution, not to push for maximum gain.

2. What type of signals are used to conduct an SSB two-tone test?

A. Two audio signals of the same frequency, but shifted 90 degrees in phase.

B. Two non-harmonically related audio signals that are within the modulation band pass of the transmitter.

C. Two different audio frequency square wave signals of equal amplitude.

D. Any two audio frequencies as long as they are harmonically related.

Two-tone intermodulation testing uses two audio tones that are non-harmonically related and placed inside the transmitter's modulation bandwidth. Feeding these two tones into the modulator stresses the system's linearity, causing intermodulation products (sums and differences of the tones) to appear throughout the transmitted spectrum. Because the tones are non-harmonically related, the intermod products don't align neatly with simple harmonic lines, giving a clearer picture of nonlinear distortions across the band. Keeping the tones within the modulation bandwidth ensures those distortion products show up in the actual SSB signal for measurement. Using the same tone, square waves, or harmonically related tones wouldn't reveal the same spread of intermod products or would obscure how the transmitter handles simultaneous signals.

3. An optoisolator is built using which two key components?

A. It uses magnetic coupling.

B. It uses light to transfer signals between input and output.

C. It uses acoustic coupling.

D. It uses direct electrical connection.

An optoisolator uses light to pass a signal from one side to the other while keeping the two sides electrically separate. The input side has an LED that converts the electrical signal into light, and the output side has a photodetector that converts that light back into an electrical signal. The two sides are separated by a light-tight barrier, providing galvanic isolation to protect circuits from voltage spikes or ground differences. That's why the statement about using light to transfer signals between input and output is the best fit. The other ideas involve magnetic coupling (like a transformer), acoustic coupling, or a direct electrical connection—none of which achieve optical isolation the way an optoisolator does.

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4. What is the magnitude of the impedance of a series network consisting of a 400-ohm resistor, a 600-ohm inductor reactance, and a 300-ohm capacitor reactance?

A. 400 Ω

B. 500 Ω

C. 600 Ω

D. 700 Ω

In a series circuit with a resistor and reactive elements, the impedance combines like perpendicular components: the resistance forms one leg and the net reactance forms the other. The magnitude of the impedance is found from the Pythagorean relation |Z| = sqrt(R^2 + (X_L − X_C)^2). Here, the resistor is 400 Ω, the inductive reactance is 600 Ω, and the capacitive reactance is 300 Ω. The net reactance is X_L − X_C = 600 − 300 = 300 Ω. Therefore, |Z| = sqrt(400^2 + 300^2) = sqrt(160000 + 90000) = sqrt(250000) = 500 Ω. This shows why the result is 500 ohms: you must combine the resistive and net reactive parts as perpendicular components, not simply add their magnitudes.

5. What is the description of an optocoupler?

A. A resistor and a capacitor

B. Two light sources modulated onto a mirrored surface

C. An LED and a photosensitive device

D. An amplitude modulated beam encoder

An optocoupler transfers a signal between two electrically isolated circuits using light. It contains a light-emitting diode on the input side and a photosensitive detector (such as a phototransistor or photodiode) on the output side, with a transparent insulating barrier between them. When the input current drives the LED, light crosses the barrier and activates the detector, recreating the electrical signal on the output while keeping the two sides electrically isolated. This isolation helps protect the controlled circuit from noise and surges. The other descriptions don't match this LED–to–photodetector arrangement and isolation mechanism.

6. Conductance takes place in a waveguide:

A. By interelectron delay

B. Through electrostatic field reluctance

C. In the same manner as a transmission line

D. Through electromagnetic and electrostatic fields in the walls of the waveguide

In a waveguide, energy is carried by electromagnetic fields that exist inside the guide and are supported by the conducting walls. The metal walls impose boundary conditions that create surface currents and charges, shaping the electric and magnetic field distribution. The combination of these electromagnetic fields flows along the axis of the guide, and the energy transfer is described by the Poynting vector pointing down the length of the waveguide. The boundary fields on the walls—the electric field terminating on surface charges and the accompanying magnetic field looping around the currents—are what enable the wave to propagate, i.e., to conduct power along the guide. This is why the correct statement is that conductance occurs through electromagnetic and electrostatic fields in the walls of the waveguide.

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7. Which statement about Iridium satellites is true?

A. There are 48 satellites in orbit in 4 orbital planes.

B. The inclination of the orbital planes is 55 degrees.

C. There are 48 spot beams per satellite with a footprint of 30 miles in diameter.

D. The orbital period is approximately 85 minutes.

The idea being tested is how Iridium satellites provide global coverage using multiple narrow ground beams. Each Iridium satellite is designed to project several focused beams toward the Earth, creating many ground footprints that can be switched between as the satellite moves. The statement that there are 48 spot beams per satellite with a footprint about 30 miles in diameter reflects this multi-beam approach: the satellite isn't just a single broad beam, but a collection of narrower beams that collectively cover the ground in overlapping areas, enabling continuous communication as the constellation moves overhead or as different satellites come into view. Understanding this helps you see why other numbers given for Iridium aren't representative of its usual design. The system uses a constellation arranged to maintain near-global coverage, with multiple beams per satellite to ensure ground users are within a beam at all times, even as satellites orbit in their paths.

8. Which network configuration provides the most effective harmonic suppression?

A. Pi network

B. L-network

C. Pi-L network

D. Inverse L network

Harmonic suppression is achieved by shaping the output network so that harmonics see a path to ground or are otherwise blocked, while the fundamental remains well-matched to the load. A Pi-L network does this effectively by combining a low-pass filter structure with an impedance-transforming section. The Pi portion (two capacitors to ground with a series inductor) acts as a low-pass filter. At the fundamental frequency, the capacitors present relatively high impedance, so they don't load the signal. At harmonic frequencies, their impedance drops, providing a path to ground and attenuating those harmonics before they reach the load or radiate. The added L section tunes the circuit to improve the overall attenuation pattern and maintain a good match at the operating frequency, giving deeper and broader suppression of harmonics than a single Pi or L network alone. A simple L-network is mainly about impedance transformation and doesn't inherently provide strong harmonic filtering. The inverse L network is used in different matching scenarios and isn't optimized for broad harmonic suppression. By combining the filtering action of a Pi network with the tuning capability of an L section, the Pi-L configuration delivers the most effective harmonic suppression.

9. What occurs if the load is removed from an operating series DC motor?

A. It will stop running.

B. Speed will increase slightly.

C. No change occurs.

D. It will accelerate until it falls apart.

In a series DC motor, the field winding is in series with the armature, so the magnetic field strength depends on the armature current. When the load is removed, there's almost no opposing torque, so the motor speeds up. As speed increases, the back-EMF grows, which reduces the armature current and thus weakens the magnetic field even more. That weaker field means the motor loses the ability to generate torque to oppose further acceleration, so the speed climbs until some limit stops it—usually a mechanical or electrical limit like bearings, insulation, or supply constraints. In practice, this can lead to a dangerous runaway condition, which is why the motor may continue accelerating until it fails.

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10. Which statement best describes spread-spectrum communication?

A. It varies the RF carrier according to a predetermined sequence

B. It uses a single narrowband carrier with simple modulation

C. It relies on high-power amplifiers

D. It minimizes bandwidth usage

Spread-spectrum communication spreads a signal across a wider portion of the spectrum by varying the RF carrier according to a predetermined sequence. This variation can happen in two common ways: direct-sequence spreading, where the data are multiplied by a high-rate pseudorandom code, and frequency-hopping spreading, where the carrier hops among frequencies following a hopping pattern. The key idea is that the carrier is not fixed; it changes according to a code, which broadens the overall bandwidth of the transmitted signal. This broadening improves resistance to interference and jamming and allows multiple users to share the same spectrum more effectively. The option describing a single narrowband carrier with simple modulation does not reflect spread-spectrum behavior, since spread-spectrum intentionally uses a wide bandwidth rather than a narrow one. The notion of relying on high-power amplifiers isn't what defines spread-spectrum, and the idea of minimizing bandwidth usage contradicts the purpose of spreading the signal over a larger band.

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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:

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

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