2019 – 2023 General Question Pool Study Guide

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Subelement G1 - Commission's Rules

Group G1A - General Class control operator frequency privileges; primary and secondary allocations

G1A01: On which HF/MF bands is a General class license holder granted all amateur frequency privileges?

160 meters, 60 meters, 30 meters, 17 meters, 12 meters, and 10 meters

G1A02: On which of the following bands is phone operation prohibited?

30 meters

G1A03: On which of the following bands is image transmission prohibited?

30 meters

G1A04: Which of the following amateur bands is restricted to communication only on specific channels, rather than frequency ranges?

60 meters

G1A05: Which of the following frequencies is in the General class portion of the 40-meter band (in ITU Region 2)?

7.250 MHz

G1A06: Which of the following frequencies is within the General class portion of the 75-meter phone band?

3900 kHz

G1A07: Which of the following frequencies is within the General class portion of the 20-meter phone band?

14305 kHz

G1A08: Which of the following frequencies is within the General class portion of the 80-meter band?

3560 kHz

G1A09: Which of the following frequencies is within the General class portion of the 15-meter band?

21300 kHz

G1A10: Which of the following frequencies is available to a control operator holding a General class license?

All these choices are correct

28.020 MHz

28.350 MHz

28.550 MHz

G1A11: When General class licensees are not permitted to use the entire voice portion of a band, which portion of the voice segment is generally available to them?

The upper frequency end

G1A12: Which of the following applies when the FCC rules designate the Amateur Service as a secondary user on a band?

Amateur stations can use the band only if they do not cause harmful interference to primary users

G1A13: What is the appropriate action if, when operating on either the 30-meter or 60-meter bands, a station in the primary service interferes with your contact?

Move to a clear frequency or stop transmitting

G1A14: Which of the following may apply in areas under FCC jurisdiction outside of ITU Region 2?

Frequency allocations may differ

G1A15: What portion of the 10-meter band is available for repeater use?

The portion above 29.5 MHz

Group G1B - Antenna structure limitations; good engineering and good amateur practice; beacon operation; prohibited transmissions; retransmitting radio signals

G1B01: What is the maximum height above ground to which an antenna structure may be erected without requiring notification to the FAA and registration with the FCC, provided it is not at or near a public use airport?

200 feet

G1B02: With which of the following conditions must beacon stations comply?

There must be no more than one beacon signal transmitting in the same band from the same station location

G1B03: Which of the following is a purpose of a beacon station as identified in the FCC rules?

Observation of propagation and reception

G1B04: Which of the following transmissions is permitted?

Occasional retransmission of weather and propagation forecast information from U.S. government stations

G1B05: Which of the following one-way transmissions are permitted?

Transmissions necessary to assist learning the International Morse code

G1B06: Under what conditions are state and local governments permitted to regulate Amateur Radio antenna structures?

Amateur Service communications must be reasonably accommodated, and regulations must constitute the minimum practical to accommodate a legitimate purpose of the state or local entity

G1B07: What are the restrictions on the use of abbreviations or procedural signals in the Amateur Service?

They may be used if they do not obscure the meaning of a message

G1B08: When choosing a transmitting frequency, what should you do to comply with good amateur practice?

All these choices are correct

Ensure that the frequency and mode selected are within your license class privileges

Follow generally accepted band plans agreed to by the Amateur Radio community

Monitor the frequency before transmitting

G1B09: On what HF frequencies are automatically controlled beacons permitted?

28.20 MHz to 28.30 MHz

G1B10: What is the power limit for beacon stations?

100 watts PEP output

G1B11: Who or what determines "good engineering and good amateur practice," as applied to the operation of an amateur station in all respects not covered by the Part 97 rules?

The FCC

G1B12: When is it permissible to communicate with amateur stations in countries outside the areas administered by the Federal Communications Commission?

When the contact is with amateurs in any country except those whose administrations have notified the ITU that they object to such communications

G1C – Transmitter power regulations; data emission standards; 60-meter operation requirements

G1C01: What is the maximum transmitting power an amateur station may use on 10.140 MHz?

200 watts PEP output

G1C02: What is the maximum transmitting power an amateur station may use on the 12-meter band?

1500 watts PEP output

G1C03: What is the maximum bandwidth permitted by FCC rules for Amateur Radio stations transmitting on USB frequencies in the 60-meter band?

2.8 kHz

G1C04: Which of the following limitations apply to transmitter power on every amateur band?

Only the minimum power necessary to carry out the desired communications should be used

G1C05: What is the limit for transmitter power on the 28 MHz band for a General Class control operator?

1500 watts PEP output

G1C06: What is the limit for transmitter power on the 1.8 MHz band?

1500 watts PEP output

G1C07: What is the maximum symbol rate permitted for RTTY or data emission transmission on the 20-meter band?

300 baud

G1C08: What is the maximum symbol rate permitted for RTTY or data emission transmitted at frequencies below 28 MHz?

300 baud

G1C09: What is the maximum symbol rate permitted for RTTY or data emission transmitted on the 1.25-meter and 70-centimeter bands?

56 kilobaud

G1C10: What is the maximum symbol rate permitted for RTTY or data emission transmissions on the 10-meter band?

1200 baud

G1C11: What is the maximum symbol rate permitted for RTTY or data emission transmissions on the 2-meter band?

19.6 kilobaud

G1C12: Which of the following is required by the FCC rules when operating in the 60-meter band?

If you are using an antenna other than a dipole, you must keep a record of the gain of your antenna

G1C13: What must be done before using a new digital protocol on the air?

Publicly document the technical characteristics of the protocol

G1C14: What is the maximum power limit on the 60-meter band?

ERP of 100 watts PEP with respect to a dipole

G1C15: What measurement is specified by FCC rules that regulate maximum power output?

PEP

G1D – Volunteer Examiners and Volunteer Examiner Coordinators; temporary identification; element credit

G1D01: Who may receive partial credit for the elements represented by an expired Amateur Radio license?

Any person who can demonstrate that they once held an FCC-issued General, Advanced, or Amateur Extra class license that was not revoked by the FCC

G1D02: What license examinations may you administer when you are an accredited VE holding a General class operator license?

Technician only

G1D03: On which of the following band segments may you operate if you are a Technician class operator and have a Certificate of Successful Completion of Examination (CSCE) for General class privileges?

On any General or Technician class band segment

G1D04: Which of the following is a requirement for administering a Technician class license examination?

At least three General class or higher VEs must observe the examination

G1D05: Which of the following must a person have before they can be an administering VE for a Technician class license examination?

An FCC General class or higher license and VEC accreditation

G1D06: When must you add the special identifier "AG" after your call sign if you are a Technician class licensee and have a Certificate of Successful Completion of Examination (CSCE) for General

class operator privileges, but the FCC has not yet posted your upgrade on its website?

Whenever you operate using General class frequency privileges

G1D07: Volunteer Examiners are accredited by what organization?

A Volunteer Examiner Coordinator

G1D08: Which of the following criteria must be met for a non-U.S. citizen to be an accredited Volunteer Examiner?

The person must hold an FCC granted Amateur Radio license of General class or above

G1D09: How long is a Certificate of Successful Completion of Examination (CSCE) valid for exam element credit?

365 days

G1D10: What is the minimum age that one must be to qualify as an accredited Volunteer Examiner?

18 years

G1D11: What is required to obtain a new General Class license after a previously-held license has expired and the two-year grace period has passed?

The applicant must pass the current Element 2 exam

G1E – Control categories; repeater regulations; third-party rules; ITU regions; automatically controlled digital station

G1E01: Which of the following would disqualify a third party from participating in stating a message over an amateur station?

The third party's amateur license has been revoked and not reinstated

G1E02: When may a 10-meter repeater retransmit the 2-meter signal from a station that has a Technician class control operator?

Only if the 10-meter repeater control operator holds at least a General class license

G1E03: What is required to conduct communications with a digital station operating under automatic control outside the automatic control band segments?

The station initiating the contact must be under local or remote control

G1E04: Which of the following conditions require a licensed Amateur Radio operator to take specific steps to avoid harmful interference to other users or facilities?

All these choices are correct

When operating within one mile of an FCC Monitoring Station

When using a band where the Amateur Service is secondary

When a station is transmitting spread spectrum emissions

G1E05: What types of messages for a third party in another country may be transmitted by an amateur station?

Only messages relating to Amateur Radio or remarks of a personal character, or messages relating to emergencies or disaster relief

G1E06: The frequency allocations of which ITU region apply to radio amateurs operating in North and South America?

Region 2

G1E07: In what part of the 13-centimeter band may an amateur station communicate with non-licensed Wi-Fi stations?

No part

G1E08: What is the maximum PEP output allowed for spread spectrum transmissions?

10 watts

G1E09: Under what circumstances are messages that are sent via digital modes exempt from Part 97 third-party rules that apply to other modes of communication?

Under no circumstances

G1E10: Why should an amateur operator normally avoid transmitting on 14.100, 18.110, 21.150, 24.930 and 28.200 MHz?

A system of propagation beacon stations operates on those frequencies

G1E11: On what bands may automatically controlled stations transmitting RTTY or data emissions communicate with other automatically controlled digital stations?

Anywhere in the 6-meter or shorter wavelength bands, and in limited segments of some of the HF bands

SUBELEMENT G2 – OPERATING PROCEDURES

G2A – Phone operating procedures; USB/LSB conventions; breaking into a contact; VOX operation

G2A01: Which sideband is most commonly used for voice communications on frequencies of 14 MHz or higher?

Upper sideband

G2A02: Which of the following modes is most commonly used for voice communications on the 160-meter, 75-meter, and 40-meter bands?

Lower sideband

G2A03: Which of the following is most commonly used for SSB voice communications in the VHF and UHF bands?

Upper sideband

G2A04: Which mode is most commonly used for voice communications on the 17-meter and 12-meter bands?

Upper sideband

G2A05: Which mode of voice communication is most commonly used on the HF amateur bands?

Single sideband

G2A06: Which of the following is an advantage when using single sideband, as compared to other analog voice modes on the HF amateur bands?

Less bandwidth used and greater power efficiency

G2A07: Which of the following statements is true of the single sideband voice mode?

Only one sideband is transmitted; the other sideband and carrier are suppressed

G2A08: What is the recommended way to break in to a phone contact?

Say your call sign once

G2A09: Why do most amateur stations use lower sideband on the 160-meter, 75-meter, and 40-meter bands?

It is good amateur practice

G2A10: Which of the following statements is true of voice VOX operation versus PTT operation?

It allows "hands free" operation

G2A11: Generally, who should respond to a station in the contiguous 48 states who calls "CQ DX"?

Any stations outside the lower 48 states

G2A12: What control is typically adjusted for proper ALC setting on an amateur single sideband transceiver?

Transmit audio or microphone gain

G2B – Operating courtesy; band plans; emergencies, including drills and emergency communications

G2B01: Which of the following is true concerning access to frequencies?

Except during emergencies, no amateur station has priority access to any frequency

G2B02: What is the first thing you should do if you are communicating with another amateur station and hear a station in distress break in?

Acknowledge the station in distress and determine what assistance may be needed

G2B03: What is good amateur practice if propagation changes during a contact and you notice interference from other stations on the frequency?

Attempt to resolve the interference problem with the other stations in a mutually acceptable manner

G2B04: When selecting a CW transmitting frequency, what minimum separation should be used to minimize interference to stations on adjacent frequencies?

150 to 500 Hz

G2B05: When selecting an SSB transmitting frequency, what minimum separation should be used to minimize interference to stations on adjacent frequencies?

Approximately 3 kHz

G2B06: What is a practical way to avoid harmful interference on an apparently clear frequency before calling CQ on CW or phone?

Send "QRL?" on CW, followed by your call sign; or, if using phone, ask if the frequency is in use, followed by your call sign

G2B07: Which of the following complies with good amateur practice when choosing a frequency on which to initiate a call?

Follow the voluntary band plan for the operating mode you intend to use

G2B08: What is the voluntary band plan restriction for U.S. stations transmitting within the 48 contiguous states in the 50.1 to 50.125 MHz band segment?

Only contacts with stations not within the 48 contiguous states

G2B09: Who may be the control operator of an amateur station transmitting in RACES to assist relief operations during a disaster?

Only a person holding an FCC-issued amateur operator license

G2B10 – When is an amateur station allowed to use any means at its disposal to assist another station in distress?

At any time during an actual emergency

G2B11 – What frequency should be used to send a distress call?

Whichever frequency has the best chance of communicating the distress message

G2C – CW operating procedures and procedural signals; Q signals and common abbreviations: full break-in

G2C01: Which of the following describes full break-in telegraphy (QSK)?

Transmitting stations can receive between code characters and elements

G2C02: What should you do if a CW station sends "QRS?"

Send slower

G2C03: What does it mean when a CW operator sends "KN" at the end of a transmission?

Listening only for a specific station or stations

G2C04: What does the Q signal "QRL?" mean?

"Are you busy?" or "Is this frequency in use?"

G2C05: What is the best speed to use when answering a CQ in Morse code?

The fastest speed at which you are comfortable copying, but no faster than the CQ

G2C06: What does the term "zero beat" mean in CW operation?

Matching the transmit frequency to the frequency of a received signal

G2C07: When sending CW, what does a "C" mean when added to the RST report?

Chirpy or unstable signal

G2C08: What prosign is sent to indicate the end of a formal message when using CW?

AR

G2C09: What does the Q signal "QSL" mean?

I acknowledge receipt

G2C10: What does the Q signal "QRN" mean?

I am troubled by static

G2C11: What does the Q signal "QRV" mean?

I am ready to receive messages

G2D – Volunteer Monitoring Program; HF operations

G2D01: What is the Volunteer Monitoring Program?

Amateur volunteers who are formally enlisted to monitor the airwaves for rules violations

G2D02: Which of the following are objectives of the Volunteer Monitoring Program?

To encourage amateur radio operators to self-regulate and comply with the rules

G2D03: What skills learned during hidden transmitter hunts are of help to the Volunteer Monitoring Program?

Direction finding used to locate stations violating FCC rules

G2D04: Which of the following describes an azimuthal projection map?

A map that shows true bearings and distances from a particular location

G2D05: Which of the following is a good way to indicate on a clear frequency in the HF phone bands that you are looking for a contact with any station?

Repeat "CQ" a few times, followed by "this is," then your call sign a few times, then pause to listen, repeat as necessary

G2D06: How is a directional antenna pointed when making a "long-path" contact with another station?

180 degrees from the station's short-path heading

G2D07: Which of the following are examples of the NATO Phonetic Alphabet?

Alpha, Bravo, Charlie, Delta

G2D08: What is a reason why many amateurs keep a station log?

To help with a reply if the FCC requests information

G2D09: Which of the following is required when participating in a contest on HF frequencies?

Identify your station per normal FCC regulations

G2D10: What is QRP operation?

Low-power transmit operation

G2D11: Which of the following is typical of the lower HF frequencies during the summer?

High levels of atmospheric noise or "static"

G2E – Digital operating procedures

G2E01: Which mode is normally used when sending RTTY signals via AFSK with an SSB transmitter?

LSB

G2E02: How can a PACTOR modem or controller be used to determine if the channel is in use by other PACTOR stations?

Put the modem or controller in a mode which allows monitoring communications without a connection

G2E03: What symptoms may result from other signals interfering with a PACTOR or WINMOR transmission?

All these choices are correct

Frequent retries or timeouts
Long pauses in message transmission
Failure to establish a connection between stations

G2E04: What segment of the 20-meter band is most often used for digital transmissions (avoiding the DX propagation beacons)?

14.070 - 14.112 MHz

G2E05: What is the standard sideband used to generate a JT65, JT9, or FT8 digital signal when using AFSK in any amateur band?

USB

G2E06: What is the most common frequency shift for RTTY emissions in the amateur HF bands?

170 Hz

G2E07: What segment of the 80-meter band is most commonly used for digital transmissions?

3570 – 3600 kHz

G2E08: In what segment of the 20-meter band are most PSK31 operations commonly found?

Below the RTTY segment, near 14.070 MHz

G2E09: How do you join a contact between two stations using the PACTOR protocol?

Joining an existing contact is not possible, PACTOR connections are limited to two stations

G2E10: Which of the following is a way to establish contact with a digital messaging system gateway station?

Transmit a connect message on the station's published frequency

G2E11: Which of the following is characteristic of the FT8 mode of the WSJT-X family?

Typical exchanges are limited to call signs, grid locators, and signal reports

G2E12: Which of the following connectors would be a good choice for a serial data port?

DE-9

G2E13: Which communication system sometimes uses the internet to transfer messages?

Winlink

G2E14: What could be wrong if you cannot decode an RTTY or other FSK signal even though it is apparently tuned in properly?

All these choices are correct

The mark and space frequencies may be reversed
You may have selected the wrong baud rate
You may be listening on the wrong sideband

G2E15: Which of the following is a requirement when using the FT8 digital mode?

Computer time accurate within approximately 1 second

SUBELEMENT G3 – RADIO WAVE PROPAGATION

G3A – Sunspots and solar radiation; ionospheric disturbances; propagation forecasting and indices

G3A01: What is the significance of the sunspot number with regard to HF propagation?

Higher sunspot numbers generally indicate a greater probability of good propagation at higher frequencies

G3A02: What effect does a Sudden Ionospheric Disturbance have on the daytime ionospheric propagation of HF radio waves?

It disrupts signals on lower frequencies more than those on higher frequencies

G3A03: Approximately how long does it take the increased ultraviolet and X-ray radiation from solar flares to affect radio propagation on Earth?

8 minutes

G3A04: Which of the following are least reliable for long-distance communications during periods of low solar activity?

15 meters, 12 meters, and 10 meters

G3A05: What is the solar flux index?

A measure of solar radiation at 10.7 centimeters wavelength

G3A06: What is a geomagnetic storm?

A temporary disturbance in Earth's magnetosphere

G3A07: At what point in the solar cycle does the 20-meter band usually support worldwide propagation during daylight hours?

At any point in the solar cycle

G3A08: Which of the following effects can a geomagnetic storm have on radio propagation?

Degraded high-latitude HF propagation

G3A09: What benefit can high geomagnetic activity have on radio communications?

Auroras that can reflect VHF signals

G3A10: What causes HF propagation conditions to vary periodically in a roughly 28-day cycle?

The sun's rotation on its axis

G3A11: How long does it take charged particles from coronal mass ejections to affect radio propagation on Earth?

20 to 40 hours

G3A12: What does the K-index indicate?

The short-term stability of Earth's magnetic field

G3A13: What does the A-index indicate?

The long-term stability of Earth's geomagnetic field

G3A14: How are radio communications usually affected by the charged particles that reach Earth from solar coronal holes?

HF communications are disturbed

G3B – Maximum Usable Frequency; Lowest Usable Frequency; propagation

G3B01: What is a characteristic of skywave signals arriving at your location by both short-path and long-path propagation?

A slightly delayed echo might be heard

G3B02: What factors affect the MUF?

All these choices are correct

Path distance and location

Time of day and season

Solar radiation and ionospheric disturbances

G3B03: Which of the following applies when selecting a frequency for lowest attenuation when transmitting on HF?

Select a frequency just below the MUF

G3B04: What is a reliable way to determine if the MUF is high enough to support skip propagation between your station and a distant location on frequencies between 14 and 30 MHz?

Listen for signals from an international beacon in the frequency range you plan to use

G3B05: What usually happens to radio waves with frequencies below the MUF and above the LUF when they are sent into the ionosphere?

They are bent back to Earth

G3B06: What usually happens to radio waves with frequencies below the LUF?

They are completely absorbed by the ionosphere

G3B07: What does LUF stand for?

The Lowest Usable Frequency for communications between two points

G3B08: What does MUF stand for?

The Maximum Usable Frequency for communications between two points

G3B09: What is the approximate maximum distance along the Earth's surface that is normally covered in one hop using the F2 region?

2,500 miles

G3B10: What is the approximate maximum distance along the Earth's surface that is normally covered in one hop using the E region?

1,200 miles

G3B11: What happens to HF propagation when the LUF exceeds the MUF?

No HF radio frequency will support ordinary skywave communications over the path

G3C – Ionospheric layers; critical angle and frequency; HF scatter; Near Vertical Incidence Skywave

G3C01: Which ionospheric layer is closest to the surface of Earth?

The D layer

G3C02: Where on Earth do ionospheric layers reach their maximum height?

Where the sun is overhead

G3C03: Why is the F2 region mainly responsible for the longest distance radio wave propagation?

Because it is the highest ionospheric region

G3C04: What does the term "critical angle" mean, as used in radio wave propagation?

The highest takeoff angle that will return a radio wave to Earth under specific ionospheric conditions

G3C05: Why is long-distance communication on the 40-meter, 60-meter, 80-meter, and 160-meter bands more difficult during the day?

The D layer absorbs signals at these frequencies during daylight hours

G3C06: What is a characteristic of HF scatter?

Signals have a fluttering sound

G3C07: What makes HF scatter signals often sound distorted?

Energy is scattered into the skip zone through several different radio wave paths

G3C08: Why are HF scatter signals in the skip zone usually weak?

Only a small part of the signal energy is scattered into the skip zone

G3C09: What type of propagation allows signals to be heard in the transmitting station's skip zone?

Scatter

G3C10: What is Near Vertical Incidence Skywave (NVIS) propagation?

Short distance MF or HF propagation using high elevation angles

G3C11: Which ionospheric layer is the most absorbent of long skip signals during daylight hours on frequencies below 10 MHz?

The D layer

SUBELEMENT G4 – AMATEUR RADIO PRACTICES

G4A – Station operation and setup

G4A01: What is the purpose of the "notch filter" found on many HF transceivers?

To reduce interference from carriers in the receiver passband

G4A02: What is one advantage of selecting the opposite, or "reverse," sideband when receiving CW signals on a typical HF transceiver?

It may be possible to reduce or eliminate interference from other signals

G4A03: What is normally meant by operating a transceiver in "split" mode?

The transceiver is set to different transmit and receive frequencies

G4A04: What reading on the plate current meter of a vacuum tube RF power amplifier indicates correct adjustment of the plate tuning control?

A pronounced dip

G4A05: What is a reason to use Automatic Level Control (ALC) with an RF power amplifier?

To reduce distortion due to excessive drive

G4A06: What type of device is often used to match transmitter output impedance to an impedance not equal to 50 ohms?

Antenna coupler or antenna tuner

G4A07: What condition can lead to permanent damage to a solid-state RF power amplifier?

Excessive drive power

G4A08: What is the correct adjustment for the load or coupling control of a vacuum tube RF power amplifier?

Maximum power output without exceeding maximum allowable plate current

G4A09: Why is a time delay sometimes included in a transmitter keying circuit?

To allow time for transmit-receive changeover operations to complete properly before RF output is allowed

G4A10: What is the purpose of an electronic keyer?

Automatic generation of strings of dots and dashes for CW operation

G4A11: Which of the following is a use for the IF shift control on a receiver?

To avoid interference from stations very close to the receive frequency

G4A12: Which of the following is a common use for the dual-VFO feature on a transceiver?

To permit monitoring of two different frequencies

G4A13: What is one reason to use the attenuator function that is present on many HF transceivers?

To reduce signal overload due to strong incoming signals

G4A14: What is likely to happen if a transceiver's ALC system is not set properly when transmitting AFSK signals with the radio using single sideband mode?

Improper action of ALC distorts the signal and can cause spurious emissions

G4A15: Which of the following can be a symptom of transmitted RF being picked up by an audio cable carrying AFSK data signals between a computer and a transceiver?

All these choices are correct

The VOX circuit does not un-key the transmitter

The transmitter signal is distorted

Frequent connection timeouts

G4A16: How does a noise blanker work?

By reducing receiver gain during a noise pulse

G4A17: What happens as the noise reduction control level in a receiver is increased?

Received signals may become distorted

G4B – Test and monitoring equipment; two-tone test

G4B01: What item of test equipment contains horizontal and vertical channel amplifiers?

An oscilloscope

G4B02: Which of the following is an advantage of an oscilloscope versus a digital voltmeter?

Complex waveforms can be measured

G4B03: Which of the following is the best instrument to use when checking the keying waveform of a CW transmitter?

An oscilloscope

G4B04: What signal source is connected to the vertical input of an oscilloscope when checking the RF envelope pattern of a transmitted signal?

The attenuated RF output of the transmitter

G4B05: Why is high input impedance desirable for a voltmeter?

It decreases the loading on circuits being measured

G4B06: What is an advantage of a digital voltmeter as compared to an analog voltmeter?

Better precision for most uses

G4B07: What signals are used to conduct a two-tone test?

Two non-harmonically related audio signals

G4B08: Which of the following instruments may be used to monitor relative RF output when making antenna and transmitter adjustments?

A field strength meter

G4B09: Which of the following can be determined with a field strength meter?

The radiation pattern of an antenna

G4B10: Which of the following can be determined with a directional wattmeter?

Standing wave ratio

G4B11: Which of the following must be connected to an antenna analyzer when it is being used for SWR measurements?

Antenna and feed line

G4B12: What problem can occur when making measurements on an antenna system with an antenna analyzer?

Strong signals from nearby transmitters can affect the accuracy of measurements

G4B13: What is a use for an antenna analyzer other than measuring the SWR of an antenna system?

Determining the impedance of coaxial cable

G4B14: What is an instance in which the use of an instrument with analog readout may be preferred over an instrument with digital readout?

When adjusting tuned circuits

G4B15: What type of transmitter performance does a two-tone test analyze?

Linearity

G4C – Interference to consumer electronics; grounding; DSP

G4C01: Which of the following might be useful in reducing RF interference to audio frequency devices?

Bypass capacitor

G4C02: Which of the following could be a cause of interference covering a wide range of frequencies?

Arcing at a poor electrical connection

G4C03: What sound is heard from an audio device or telephone if there is interference from a nearby single sideband phone transmitter?

Distorted speech

G4C04: What is the effect on an audio device when there is interference from a nearby CW transmitter?

On-and-off humming or clicking

G4C05: What might be the problem if you receive an RF burn when touching your equipment while transmitting on an HF band, assuming the equipment is connected to a ground rod?

The ground wire has high impedance on that frequency

G4C06: What effect can be caused by a resonant ground connection?

High RF voltages on the enclosures of station equipment

G4C07: Why should soldered joints not be used with the wires that connect the base of a tower to a system of ground rods?

A soldered joint will likely be destroyed by the heat of a lightning strike

G4C08: Which of the following would reduce RF interference caused by common-mode current on an audio cable?

Placing a ferrite choke around the cable

G4C09: How can a ground loop be avoided?

Connect all ground conductors to a single point

G4C10: What could be a symptom of a ground loop somewhere in your station?

You receive reports of "hum" on your station's transmitted signal

G4C11: What technique helps to minimize RF "hot spots" in an amateur station?

Bonding all equipment enclosures together

G4C12: Which of the following is an advantage of a receiver DSP IF filter as compared to an analog filter?

A wide range of filter bandwidths and shapes can be created

G4C13: Why must the metal enclosure of every item of station equipment be grounded?

It ensures that hazardous voltages cannot appear on the chassis

G4D – Speech processors; S meters; sideband operation near band edges

G4D01: What is the purpose of a speech processor as used in a modern transceiver?

Increase the intelligibility of transmitted phone signals during poor conditions

G4D02: Which of the following describes how a speech processor affects a transmitted single sideband phone signal?

It increases average power

G4D03: Which of the following can be the result of an incorrectly adjusted speech processor?

All these choices are correct

Distorted speech
Splatter
Excessive background pickup

G4D04: What does an S meter measure?

Received signal strength

G4D05: How does a signal that reads 20 dB over S9 compare to one that reads S9 on a receiver, assuming a properly calibrated S meter?

It is 100 times more powerful

G4D06: Where is an S meter found?

In a receiver

G4D07: How much must the power output of a transmitter be raised to change the S meter reading on a distant receiver from S8 to S9?

Approximately 4 times

G4D08: What frequency range is occupied by a 3 kHz LSB signal when the displayed carrier frequency is set to 7.178 MHz?

7.175 to 7.178 MHz

G4D09: What frequency range is occupied by a 3 kHz USB signal with the displayed carrier frequency set to 14.347 MHz?

14.347 to 14.350 MHz

G4D10: How close to the lower edge of the phone segment should your displayed carrier frequency be when using 3 kHz wide LSB?

At least 3 kHz above the edge of the segment

G4D11: How close to the upper edge of the phone segment should your displayed carrier frequency be when using 3 kHz wide USB?

At least 3 kHz below the edge of the band

G4E – HF mobile radio installations; alternative energy source operation

G4E01: What is the purpose of a capacitance hat on a mobile antenna?

To electrically lengthen a physically short antenna

G4E02: What is the purpose of a corona ball on an HF mobile antenna?

To reduce RF voltage discharge from the tip of the antenna while transmitting

G4E03: Which of the following direct, fused power connections would be the best for a 100 watt HF mobile installation?

To the battery using heavy-gauge wire

G4E04: Why is it best NOT to draw the DC power for a 100 watt HF transceiver from a vehicle's auxiliary power socket?

The socket's wiring may be inadequate for the current drawn by the transceiver

G4E05: Which of the following most limits an HF mobile installation?

Efficiency of the electrically short antenna

G4E06: What is one disadvantage of using a shortened mobile antenna as opposed to a full-size antenna?

Operating bandwidth may be very limited

G4E07: Which of the following may cause receive interference in a radio installed in a vehicle?

All these choices are correct

The battery charging system
The fuel delivery system
The vehicle control computer

G4E08: What is the name of the process by which sunlight is changed directly into electricity?

Photovoltaic conversion

G4E09: What is the approximate open-circuit voltage from a fully illuminated silicon photovoltaic cell?

0.5 VDC

G4E10: What is the reason that a series diode is connected between a solar panel and a storage battery that is being charged by the panel?

The diode prevents self-discharge of the battery through the panel during times of low or no illumination

G4E11: Which of the following is a disadvantage of using wind as the primary source of power for an emergency station?

A large energy storage system is needed to supply power when the wind is not blowing

SUBELEMENT G5 – ELECTRICAL PRINCIPLES

G5A – Reactance; inductance; capacitance; impedance; impedance matching

G5A01: What is impedance?

The opposition to the flow of current in an AC circuit

G5A02: What is reactance?

Opposition to the flow of alternating current caused by capacitance or inductance

G5A03: Which of the following causes opposition to the flow of alternating current in an inductor?

Reactance

G5A04: Which of the following causes opposition to the flow of alternating current in a capacitor?

Reactance

G5A05: How does an inductor react to AC?

As the frequency of the applied AC increases, the reactance increases

G5A06: How does a capacitor react to AC?

As the frequency of the applied AC increases, the reactance decreases

G5A07: What happens when the impedance of an electrical load is equal to the output impedance of a power source, assuming both impedances are resistive?

The source can deliver maximum power to the load

G5A08: What is one reason to use an impedance matching transformer?

To maximize the transfer of power

G5A09: What unit is used to measure reactance?

Ohm

G5A10: Which of the following devices can be used for impedance matching at radio frequencies?

All these choices are correct

A transformer
A Pi-network
A length of transmission line

G5A11: Which of the following describes one method of impedance matching between two AC circuits?

Insert an LC network between the two circuits

G5B – The decibel; current and voltage dividers; electrical power calculations; sine wave root-mean-square (RMS) values; PEP calculations

G5B01: What dB change represents a factor of two increase or decrease in power?

Approximately 3 dB

G5B02: How does the total current relate to the individual currents in each branch of a purely resistive parallel circuit?

It equals the sum of the currents through each branch

G5B03: How many watts of electrical power are used if 400 VDC is supplied to an 800 ohm load?

200 watts

G5B04: How many watts of electrical power are used by a 12 VDC light bulb that draws 0.2 amperes?

2.4 watts

G5B05: How many watts are dissipated when a current of 7.0 milliamperes flows through a 1250 ohm resistance?

Approximately 61 milliwatts

G5B06: What is the output PEP from a transmitter if an oscilloscope measures 200 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output?

100 watts

G5B07: What value of an AC signal produces the same power dissipation in a resistor as a DC voltage of the same value?

The RMS value

G5B08: What is the peak-to-peak voltage of a sine wave with an RMS voltage of 120.0 volts?

339.4 volts

G5B09: What is the RMS voltage of a sine wave with a value of 17 volts peak?

12 volts

G5B10: What percentage of power loss would result from a transmission line loss of 1 dB?

20.6 percent

G5B11: What is the ratio of peak envelope power to average power for an unmodulated carrier?

1.00

G5B12: What would be the RMS voltage across a 50 ohm dummy load dissipating 1200 watts?

245 volts

G5B13: What is the output PEP of an unmodulated carrier if an average reading wattmeter connected to the transmitter output indicates 1060 watts?

1060 watts

G5B14: What is the output PEP from a transmitter if an oscilloscope measures 500 volts peak-to-peak across a 50 ohm resistive load connected to the transmitter output?

625 watts

G5C – Resistors, capacitors, and inductors in series and parallel; transformers

G5C01: What causes a voltage to appear across the secondary winding of a transformer when an AC voltage source is connected across its primary winding?

Mutual inductance

G5C02: What happens if a signal is applied to the secondary winding of a 4:1 voltage step-down transformer instead of the primary winding?

The output voltage is multiplied by 4

G5C03: Which of the following components increases the total resistance of a resistor?

A series resistor

G5C04: What is the total resistance of three 100 ohm resistors in parallel?

33.3 ohms

G5C05: If three equal value resistors in series produce 450 ohms, what is the value of each resistor?

150 ohms

G5C06: What is the RMS voltage across a 500-turn secondary winding in a transformer if the 2250-turn primary is connected to 120 VAC?

26.7 volts

G5C07: What is the turns ratio of a transformer used to match an audio amplifier having 600 ohm output impedance to a speaker having 4 ohm impedance?

12.2 to 1

G5C08: What is the equivalent capacitance of two 5.0 nanofarad capacitors and one 750 picofarad capacitor connected in parallel?

10.750 nanofarads

G5C09: What is the capacitance of three 100 microfarad capacitors connected in series?

33.3 microfarads

G5C10: What is the inductance of three 10 millihenry inductors connected in parallel?

3.3 millihenries

G5C11: What is the inductance of a 20 millihenry inductor connected in series with a 50 millihenry inductor?

70 millihenries

G5C12: What is the capacitance of a 20 microfarad capacitor connected in series with a 50 microfarad capacitor?

14.3 microfarads

G5C13: Which of the following components should be added to a capacitor to increase the capacitance?

A capacitor in parallel

G5C14: Which of the following components should be added to an inductor to increase the inductance?

An inductor in series

G5C15: What is the total resistance of a 10 ohm, a 20 ohm, and a 50 ohm resistor connected in parallel?

5.9 ohms

G5C16: Why is the conductor of the primary winding of many voltage step-up transformers larger in diameter than the conductor of the secondary winding?

To accommodate the higher current of the primary

G5C17: What is the value in nanofarads (nF) of a 22,000 picofarad (pF) capacitor?

22

G5C18: What is the value in microfarads of a 4700 nanofarad (nF) capacitor?

4.7

SUBELEMENT G6 – CIRCUIT COMPONENTS

G6A – Resistors; capacitors; inductors; rectifiers; solid-state diodes and transistors; vacuum tubes; batteries

G6A01: What is the minimum allowable discharge voltage for maximum life of a standard 12 volt lead-acid battery?

10.5 volts

G6A02: What is an advantage of the low internal resistance of nickel-cadmium batteries?

High discharge current

G6A03: What is the approximate junction threshold voltage of a germanium diode?

0.3 volts

G6A04: Which of the following is an advantage of an electrolytic capacitor?

High capacitance for a given volume

G6A05: What is the approximate junction threshold voltage of a conventional silicon diode?

0.7 volts

G6A06: Which of the following is a reason not to use wire-wound resistors in an RF circuit?

The resistor's inductance could make circuit performance unpredictable

G6A07: What are the stable operating points for a bipolar transistor used as a switch in a logic circuit?

Its saturation and cutoff regions

G6A08: What is an advantage of using a ferrite core toroidal inductor?

All these choices are correct

Large values of inductance may be obtained

The magnetic properties of the core may be optimized for a specific range of frequencies

Most of the magnetic field is contained in the core

G6A09: Which of the following describes the construction of a MOSFET?

The gate is separated from the channel with a thin insulating layer

G6A10: Which element of a triode vacuum tube is used to regulate the flow of electrons between cathode and plate?

Control grid

G6A11: What happens when an inductor is operated above its self-resonant frequency?

It becomes capacitive

G6A12: What is the primary purpose of a screen grid in a vacuum tube?

To reduce grid-to-plate capacitance

G6A13: Why is the polarity of applied voltages important for polarized capacitors?

All these choices are correct

Incorrect polarity can cause the capacitor to short-circuit

Reverse voltages can destroy the dielectric layer of an electrolytic capacitor

The capacitor could overheat and explode

G6A14: Which of the following is an advantage of ceramic capacitors as compared to other types of capacitors?

Comparatively low cost

G6B – Analog and digital integrated circuits (ICs); microprocessors; memory; I/O devices; microwave ICs (MMICs); display devices; connectors; ferrite cores

G6B01: What determines the performance of a ferrite core at different frequencies?

The composition, or "mix," of materials used

G6B02: What is meant by the term MMIC?

Monolithic Microwave Integrated Circuit

G6B03: Which of the following is an advantage of CMOS integrated circuits compared to TTL integrated circuits?

Low power consumption

G6B04: What is meant by the term ROM?

Read Only Memory

G6B05: What is meant when memory is characterized as non-volatile?

The stored information is maintained even if power is removed

G6B06: What kind of device is an integrated circuit operational amplifier?

Analog

G6B07: Which of the following describes a type N connector?

A moisture-resistant RF connector useful to 10 GHz

G6B08: How is an LED biased when emitting light?

Forward biased

G6B09: Which of the following is a characteristic of a liquid crystal display?

It utilizes ambient or back lighting

G6B10: How does a ferrite bead or core reduce common-mode RF current on the shield of a coaxial cable?

By creating an impedance in the current's path

G6B11: What is a type SMA connector?

A small threaded connector suitable for signals up to several GHz

G6B12: Which of these connector types is commonly used for audio signals in Amateur Radio stations?

RCA Phono

G6B13: Which of these connector types is commonly used for RF connections at frequencies up to 150 MHz?

PL-259

SUBELEMENT G7 – PRACTICAL CIRCUITS

G7A – Power supplies; schematic symbols

G7A01: What useful feature does a power supply bleeder resistor provide?

It ensures that the filter capacitors are discharged when power is removed

G7A02: Which of the following components are used in a power supply filter network?
Capacitors and inductors
G7A03: Which type of rectifier circuit uses two diodes and a center-tapped transformer?
Full-wave
G7A04: What is an advantage of a half-wave rectifier in a power supply?
Only one diode is required
G7A05: What portion of the AC cycle is converted to DC by a half-wave rectifier?
180 degrees
G7A06: What portion of the AC cycle is converted to DC by a full-wave rectifier?
360 degrees
G7A07: What is the output waveform of an unfiltered full-wave rectifier connected to a resistive load?
A series of DC pulses at twice the frequency of the AC input
G7A08: Which of the following is an advantage of a switchmode power supply as compared to a linear power supply?
High-frequency operation allows the use of smaller components
G7A09: Which symbol in figure G7-1 represents a field effect transistor?
Symbol 1

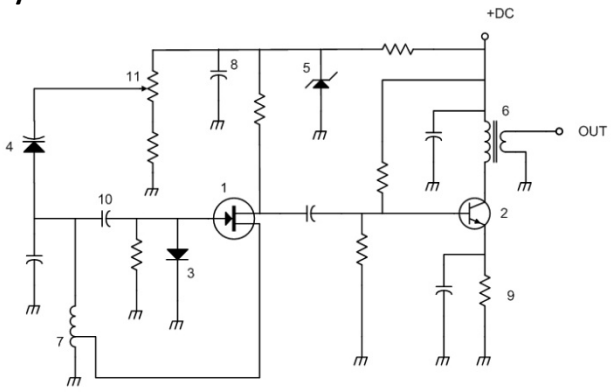

Figure G7-1

*(**NOTE**: View "Figure G7-1" larger on the last page.)*

G7A10: Which symbol in figure G7-1 represents a Zener diode?
Symbol 5
G7A11: Which symbol in figure G7-1 represents an NPN junction transistor?
Symbol 2
G7A12: Which symbol in Figure G7-1 represents a solid core transformer?
Symbol 6
G7A13: Which symbol in Figure G7-1 represents a tapped inductor?
Symbol 7

G7B – Digital circuits; amplifiers and oscillators

G7B01: What is the reason for neutralizing the final amplifier stage of a transmitter?
To eliminate self-oscillations
G7B02: Which of these classes of amplifiers has the highest efficiency?
Class C
G7B03: Which of the following describes the function of a two-input AND gate?
Output is high only when both inputs are high
G7B04: Which of the following describes the function of a two input NOR gate?
Output is low when either or both inputs are high
G7B05: How many states does a 3-bit binary counter have?
8
G7B06: What is a shift register?
A clocked array of circuits that passes data in steps along the array
G7B07: Which of the following are basic components of a sine wave oscillator?
A filter and an amplifier operating in a feedback loop
G7B08: How is the efficiency of an RF power amplifier determined?
Divide the RF output power by the DC input power
G7B09: What determines the frequency of an LC oscillator?
The inductance and capacitance in the tank circuit
G7B10: Which of the following describes a linear amplifier?
An amplifier in which the output preserves the input waveform
G7B11: For which of the following modes is a Class C power stage appropriate for amplifying a modulated signal?
FM

G7C – Receivers and transmitters; filters; oscillators

G7C01: Which of the following is used to process signals from the balanced modulator then send them to the mixer in some single sideband phone transmitters?
Filter
G7C02: Which circuit is used to combine signals from the carrier oscillator and speech amplifier then send the result to the filter in some single sideband phone transmitters?
Balanced modulator
G7C03: What circuit is used to process signals from the RF amplifier and local oscillator then send the result to the IF filter in a superheterodyne receiver?
Mixer
G7C04: What circuit is used to combine signals from the IF amplifier and BFO and send the result to the AF amplifier in some single sideband receivers?
Product detector
G7C05: Which of the following is an advantage of a direct digital synthesizer (DDS)?
Variable frequency with the stability of a crystal oscillator
G7C06: What should be the impedance of a low-pass filter as compared to the impedance of the transmission line into which it is inserted?
About the same

G7C07: What is the simplest combination of stages that implement a superheterodyne receiver?

HF oscillator, mixer, detector

G7C08: What circuit is used in analog FM receivers to convert IF output signals to audio?

Discriminator

G7C09: What is the phase difference between the I and Q signals that software-defined radio (SDR) equipment uses for modulation and demodulation?

90 degrees

G7C10: What is an advantage of using I and Q signals in software-defined radios (SDRs)?

All types of modulation can be created with appropriate processing.

G7C11: What is meant by the term "software-defined radio" (SDR)?

A radio in which most major signal processing functions are performed by software

G7C12: What is the frequency above which a low-pass filter's output power is less than half the input power?

Cutoff frequency

G7C13: What term specifies a filter's maximum ability to reject signals outside its passband?

Ultimate rejection

G7C14: The bandwidth of a band-pass filter is measured between what two frequencies?

Upper and lower half-power

G7C15: What term specifies a filter's attenuation inside its passband?

Insertion loss

G7C16: Which of the following is a typical application for a Direct Digital Synthesizer?

A high-stability variable frequency oscillator in a transceiver

SUBELEMENT G8 – SIGNALS AND EMISSIONS

G8A – Carriers and modulation: AM; FM; single sideband; modulation envelope; digital modulation; overmodulation

G8A01: How is an FSK signal generated?

By changing an oscillator's frequency directly with a digital control signal

G8A02: What is the name of the process that changes the phase angle of an RF signal to convey information?

Phase modulation

G8A03: What is the name of the process that changes the instantaneous frequency of an RF wave to convey information?

Frequency modulation

G8A04: What emission is produced by a reactance modulator connected to a transmitter RF amplifier stage?

Phase modulation

G8A05: What type of modulation varies the instantaneous power level of the RF signal?

Amplitude modulation

G8A06: Which of the following is characteristic of QPSK31?

All these choices are correct

It is sideband sensitive

Its encoding provides error correction

Its bandwidth is approximately the same as BPSK31

G8A07: Which of the following phone emissions uses the narrowest bandwidth?

Single sideband

G8A08: Which of the following is an effect of overmodulation?

Excessive bandwidth

G8A09: What type of modulation is used by the FT8 digital mode?

8-tone frequency shift keying

G8A10: What is meant by the term "flat-topping," when referring to a single sideband phone transmission?

Signal distortion caused by excessive drive

G8A11: What is the modulation envelope of an AM signal?

The waveform created by connecting the peak values of the modulated signal

G8A12: Which of the following narrow-band digital modes can receive signals with very low signal-to-noise ratios?

FT8

G8B – Frequency mixing; multiplication; bandwidths of various modes; deviation; duty cycle; intermodulation

G8B01: Which mixer input is varied or tuned to convert signals of different frequencies to an intermediate frequency (IF)?

Local oscillator

G8B02: If a receiver mixes a 13.800 MHz VFO with a 14.255 MHz received signal to produce a 455 kHz intermediate frequency (IF) signal, what type of interference will a 13.345 MHz signal produce in the receiver?

Image response

G8B03: What is another term for the mixing of two RF signals?

Heterodyning

G8B04: What is the stage in a VHF FM transmitter that generates a harmonic of a lower frequency signal to reach the desired operating frequency?

Multiplier

G8B05: What is the approximate bandwidth of a PACTOR-III signal at maximum data rate?

2300 Hz

G8B06: What is the total bandwidth of an FM phone transmission having 5 kHz deviation and 3 kHz modulating frequency?

16 kHz

G8B07: What is the frequency deviation for a 12.21 MHz reactance modulated oscillator in a 5 kHz deviation, 146.52 MHz FM phone transmitter?

416.7 Hz

G8B08: Why is it important to know the duty cycle of the mode you are using when transmitting?
Some modes have high duty cycles that could exceed the transmitter's average power rating
G8B09: Why is it good to match receiver bandwidth to the bandwidth of the operating mode?
It results in the best signal-to-noise ratio
G8B10: What is the relationship between transmitted symbol rate and bandwidth?
Higher symbol rates require wider bandwidth
G8B11: What combination of a mixer's Local Oscillator (LO) and RF input frequencies is found in the output?
The sum and difference
G8B12: What process combines two signals in a non-linear circuit or connection to produce unwanted spurious outputs?
Intermodulation

G8C – Digital emission modes

G8C01: On what band do amateurs share channels with the unlicensed Wi-Fi service?
2.4 GHz
G8C02: Which digital mode is used as a low-power beacon for assessing HF propagation?
WSPR
G8C03: What part of a packet radio frame contains the routing and handling information?
Header
G8C04: Which of the following describes Baudot code?
A 5-bit code with additional start and stop bits
G8C05: In the PACTOR protocol, what is meant by a NAK response to a transmitted packet?
The receiver is requesting the packet be retransmitted
G8C06: What action results from a failure to exchange information due to excessive transmission attempts when using PACTOR or WINMOR?
The connection is dropped
G8C07: How does the receiving station respond to an ARQ data mode packet containing errors?
It requests the packet be retransmitted
G8C08: Which of the following statements is true about PSK31?
Upper case letters use longer Varicode bit sequences and thus slow down transmission
G8C09: What does the number 31 represent in "PSK31"?
The approximate transmitted symbol rate
G8C10: How does forward error correction (FEC) allow the receiver to correct errors in received data packets?
By transmitting redundant information with the data
G8C11: How are the two separate frequencies of a Frequency Shift Keyed (FSK) signal identified?
Mark and space
G8C12: Which type of code is used for sending characters in a PSK31 signal?
Varicode
G8C13: What is indicated on a waterfall display by one or more vertical lines on either side of a digital signal?
Overmodulation
G8C14: Which of the following describes a waterfall display?
Frequency is horizontal, signal strength is intensity, time is vertical

SUBELEMENT G9 – ANTENNAS AND FEED LINES

G9A – Antenna feed lines: characteristic impedance and attenuation; SWR calculation, measurement, and effects; matching networks

G9A01: Which of the following factors determine the characteristic impedance of a parallel conductor antenna feed line?
The distance between the centers of the conductors and the radius of the conductors
G9A02: What are the typical characteristic impedances of coaxial cables used for antenna feed lines at amateur stations?
50 and 75 ohms
G9A03: What is the typical characteristic impedance of "window line" parallel transmission line?
450 ohms
G9A04: What might cause reflected power at the point where a feed line connects to an antenna?
A difference between feed-line impedance and antenna feed-point impedance
G9A05: How does the attenuation of coaxial cable change as the frequency of the signal it is carrying increases?
Attenuation increases
G9A06: In what units is RF feed line loss usually expressed?
Decibels per 100 feet
G9A07: What must be done to prevent standing waves on an antenna feed line?
The antenna feed point impedance must be matched to the characteristic impedance of the feed line
G9A08: If the SWR on an antenna feed line is 5 to 1, and a matching network at the transmitter end of the feed line is adjusted to 1 to 1 SWR, what is the resulting SWR on the feed line?
5 to 1
G9A09: What standing wave ratio will result when connecting a 50 ohm feed line to a non-reactive load having 200 ohm impedance?
4:1

G9A10: What standing wave ratio will result when connecting a 50 ohm feed line to a non-reactive load having 10 ohm impedance?

5:1

G9A11: What standing wave ratio will result when connecting a 50 ohm feed line to a non-reactive load having 50 ohm impedance?

1:1

G9A12: What is the interaction between high standing wave ratio (SWR) and transmission line loss?

If a transmission line is lossy, high SWR will increase the loss

G9A13: What is the effect of transmission line loss on SWR measured at the input to the line?

The higher the transmission line loss, the more the SWR will read artificially low

G9B – Basic antennas

G9B01: What is one disadvantage of a directly fed random-wire HF antenna?

You may experience RF burns when touching metal objects in your station

G9B02: Which of the following is a common way to adjust the feed-point impedance of a quarter wave ground-plane vertical antenna to be approximately 50 ohms?

Slope the radials downward

G9B03: Which of the following best describes the radiation pattern of a quarter-wave, ground-plane vertical antenna?

Omnidirectional in azimuth

G9B04: What is the radiation pattern of a dipole antenna in free space in a plane containing the conductor?

It is a figure-eight at right angles to the antenna

G9B05: How does antenna height affect the horizontal (azimuthal) radiation pattern of a horizontal dipole HF antenna?

If the antenna is less than 1/2 wavelength high, the azimuthal pattern is almost omnidirectional

G9B06: Where should the radial wires of a ground-mounted vertical antenna system be placed?

On the surface of the Earth or buried a few inches below the ground

G9B07: How does the feed-point impedance of a 1/2 wave dipole antenna change as the antenna is lowered below 1/4 wave above ground?

It steadily decreases

G9B08: How does the feed point impedance of a 1/2 wave dipole change as the feed point is moved from the center toward the ends?

It steadily increases

G9B09: Which of the following is an advantage of a horizontally polarized as compared to a vertically polarized HF antenna?

Lower ground reflection losses

G9B10: What is the approximate length for a 1/2 wave dipole antenna cut for 14.250 MHz?

33 feet

G9B11: What is the approximate length for a 1/2 wave dipole antenna cut for 3.550 MHz?

132 feet

G9B12: What is the approximate length for a 1/4 wave vertical antenna cut for 28.5 MHz?

8 feet

G9C – Directional antennas

G9C01: Which of the following would increase the bandwidth of a Yagi antenna?

Larger-diameter elements

G9C02: What is the approximate length of the driven element of a Yagi antenna?

1/2 wavelength

G9C03: How do the lengths of a three-element Yagi reflector and director compare to that of the driven element?

The reflector is longer, and the director is shorter

G9C04: How does antenna gain stated in dBi compare to gain stated in dBd for the same antenna?

dBi gain figures are 2.15 dB higher than dBd gain figures

G9C05: How does increasing boom length and adding directors affect a Yagi antenna?

Gain increases

G9C06: What configuration of the loops of a two-element quad antenna must be used for the antenna to operate as a beam antenna, assuming one of the elements is used as a reflector?

The reflector element must be approximately 5 percent longer than the driven element

G9C07: What does "front-to-back ratio" mean in reference to a Yagi antenna?

The power radiated in the major radiation lobe compared to that in the opposite direction

G9C08: What is meant by the "main lobe" of a directive antenna?

The direction of maximum radiated field strength from the antenna

G9C09: How does the gain of two three-element, horizontally polarized Yagi antennas spaced vertically 1/2 wavelength apart typically compare to the gain of a single three-element Yagi?

Approximately 3 dB higher

G9C10: Which of the following can be adjusted to optimize forward gain, front-to-back ratio, or SWR bandwidth of a Yagi antenna?

All these choices are correct

The physical length of the boom
The number of elements on the boom
The spacing of each element along the boom

G9C11: Which HF antenna would be the best to use for minimizing interference?

A directional antenna

G9C12: Which of the following is an advantage of using a gamma match with a Yagi antenna?
It does not require that the driven element be insulated from the boom
G9C13: Approximately how long is each side of the driven element of a quad antenna?
1/4 wavelength
G9C14: How does the forward gain of a two-element quad antenna compare to the forward gain of a three-element Yagi antenna?
About the same
G9C15: What is meant by the terms dBi and dBd when referring to antenna gain?
dBi refers to an isotropic antenna, dBd refers to a dipole antenna
G9C16: What is a beta or hairpin match?
It is a shorted transmission line stub placed at the feed point of a Yagi antenna to provide impedance matching

G9D – Specialized antennas

G9D01: Which of the following antenna types will be most effective as a Near Vertical Incidence Skywave (NVIS) antenna for short-skip communications on 40 meters during the day?
A horizontal dipole placed between 1/10 and 1/4 wavelength above the ground
G9D02: What is the feed-point impedance of an end-fed half-wave antenna?
Very high
G9D03: In which direction is the maximum radiation from a portable VHF/UHF "halo" antenna?
Omnidirectional in the plane of the halo
G9D04: What is the primary purpose of antenna traps?
To permit multiband operation
G9D05: What is an advantage of vertical stacking of horizontally polarized Yagi antennas?
It narrows the main lobe in elevation
G9D06: Which of the following is an advantage of a log periodic antenna?
Wide bandwidth
G9D07: Which of the following describes a log periodic antenna?
Element length and spacing vary logarithmically along the boom
G9D08: How does a "screwdriver" mobile antenna adjust its feed-point impedance?
By varying the base loading inductance
G9D09: What is the primary use of a Beverage antenna?
Directional receiving for low HF bands
G9D10: In which direction or directions does an electrically small loop (less than 1/3 wavelength in circumference) have nulls in its radiation pattern?
Broadside to the loop
G9D11: Which of the following is a disadvantage of multiband antennas?
They have poor harmonic rejection
G9D12: What is the common name of a dipole with a single central support?
Inverted V
G9D13: What is the combined vertical and horizontal polarization pattern of a multi-wavelength, horizontal loop antenna?
Virtually omnidirectional with a lower peak vertical radiation angle than a dipole

SUBELEMENT G0 – ELECTRICAL AND RF SAFETY

G0A – RF safety principles, rules and guidelines; routine station evaluation

G0A01: What is one way that RF energy can affect human body tissue?
It heats body tissue
G0A02: Which of the following properties is important in estimating whether an RF signal exceeds the maximum permissible exposure (MPE)?
All these choices are correct
Its duty cycle
Its frequency
Its power density
G0A03: How can you determine that your station complies with FCC RF exposure regulations?
All these choices are correct
By calculation based on FCC OET Bulletin 65
By calculation based on computer modeling
By measurement of field strength using calibrated equipment
G0A04: What does "time averaging" mean in reference to RF radiation exposure?
The total RF exposure averaged over a certain time
G0A05: What must you do if an evaluation of your station shows RF energy radiated from your station exceeds permissible limits?
Take action to prevent human exposure to the excessive RF fields
G0A06: What precaution should be taken when installing a ground-mounted antenna?
It should be installed such that it is protected against unauthorized access
G0A07: What effect does transmitter duty cycle have when evaluating RF exposure?
A lower transmitter duty cycle permits greater short-term exposure levels
G0A08: Which of the following steps must an amateur operator take to ensure compliance with RF safety regulations when transmitter power exceeds levels specified in FCC Part 97.13?
Perform a routine RF exposure evaluation
G0A09: What type of instrument can be used to accurately measure an RF field?
A calibrated field strength meter with a calibrated antenna

G0A10: What is one thing that can be done if evaluation shows that a neighbor might receive more than the allowable limit of RF exposure from the main lobe of a directional antenna?

Take precautions to ensure that the antenna cannot be pointed in their direction

G0A11: What precaution should you take if you install an indoor transmitting antenna?

Make sure that MPE limits are not exceeded in occupied areas

G0B – Station safety: electrical shock, safety grounding, fusing, interlocks, wiring, antenna and tower safety

G0B01: Which wire or wires in a four-conductor connection should be attached to fuses or circuit breakers in a device operated from a 240 VAC single phase source?

Only the two wires carrying voltage

G0B02: According the National Electrical Code, what is the minimum wire size that may be used safely for wiring with a 20 ampere circuit breaker?

AWG number 12

G0B03: Which size of fuse or circuit breaker would be appropriate to use with a circuit that uses AWG number 14 wiring?

15 amperes

G0B04: Which of the following is a primary reason for not placing a gasoline-fueled generator inside an occupied area?

Danger of carbon monoxide poisoning

G0B05: Which of the following conditions will cause a Ground Fault Circuit Interrupter (GFCI) to disconnect the 120 or 240 Volt AC line power to a device?

Current flowing from one or more of the voltage-carrying wires directly to ground

G0B06: Which of the following is covered by the National Electrical Code?

Electrical safety inside the ham shack

G0B07: Which of these choices should be observed when climbing a tower using a safety belt or harness?

Confirm that the belt is rated for the weight of the climber and that it is within its allowable service life

G0B08: What should be done by any person preparing to climb a tower that supports electrically powered devices?

Make sure all circuits that supply power to the tower are locked out and tagged

G0B09: Which of the following is true of an emergency generator installation?

The generator should be located in a well-ventilated area

G0B10: Which of the following is a danger from lead-tin solder?

Lead can contaminate food if hands are not washed carefully after handling the solder

G0B11: Which of the following is good practice for lightning protection grounds?

They must be bonded together with all other grounds

G0B12: What is the purpose of a power supply interlock?

To ensure that dangerous voltages are removed if the cabinet is opened

G0B13: What must you do when powering your house from an emergency generator?

Disconnect the incoming utility power feed

G0B14: What precaution should you take whenever you adjust or repair an antenna?

Turn off the transmitter and disconnect the feed line

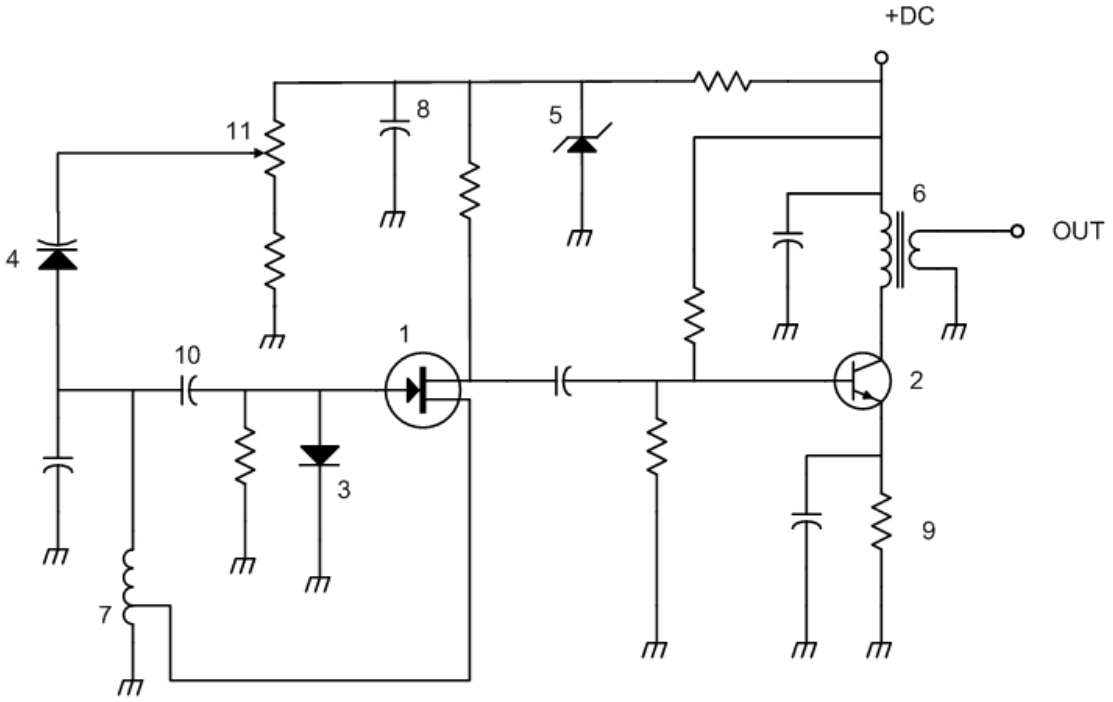

Figure G7-1