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# Advanced Qualification Question Bank for Amateur Radio Operator Certificate Examinations

Canada 



Foreword:

This question bank contains the questions that will be used effective the date printed on the title page, for making Advanced Qualification examinations for the Amateur Radio Operator Certificate.

The correct choice of the four suggested answers appears in brackets following each question identifier. i.e. A- 001- 001- 001 (D)

While every reasonable effort has been made to ensure accuracy in this document, no warranty is expressed or implied.

Candidates for amateur radio operator certificate examinations are encouraged to contact the following amateur radio organizations for information on study material.

Radio Amateurs of Canada  
720 Belfast Road, Suite 217  
Ottawa, Ontario  
K1G 0Z5  
[www.rac.ca](http://www.rac.ca)

Radio Amateur du Québec inc.  
4545 Pierre- de- Coubertin Avenue  
C.P. 1000, Succursale M  
Montréal, Quebec  
H1V 3R2  
[www.raqi.qc.ca](http://www.raqi.qc.ca)

Instructions for examiners are contained in Radiocommunication Information Circular RIC- 1, Guide for Examiners Accredited to Conduct Examinations for the Amateur Radio Operator Certificate.

For additional information, please contact the Amateur Radio Service Centre:

A-001-001-001 (D)

What is the meaning of the term "time constant" in an RL circuit ?

- A The time required for the current in the circuit to build up to 36.8% of the maximum value
- B The time required for the voltage in the circuit to build up to 63.2% of the maximum value
- C The time required for the voltage in the circuit to build up to 36.8% of the maximum value
- D The time required for the current in the circuit to build up to 63.2% of the maximum value

A-001-001-002 (C)

What is the term for the time required for the capacitor in an RC circuit to be charged to 63.2% of the supply voltage?

- A A time factor of one
- B One exponential period
- C One time constant
- D An exponential rate of one

A-001-001-003 (B)

What is the term for the time required for the current in an RL circuit to build up to 63.2% of the maximum value?

- A One exponential rate
- B One time constant
- C An exponential period of one
- D A time factor of one

A-001-001-004 (A)

What is the term for the time it takes for a charged capacitor in an RC circuit to discharge to 36.8% of its initial value of stored charge?

- A One time constant
- B A discharge factor of one
- C An exponential discharge of one
- D One discharge period

A-001-001-005 (D)

What is meant by "back EMF"?

- A A current that opposes the applied EMF
- B An opposing EMF equal to R times C percent of the applied EMF
- C A current equal to the applied EMF
- D A voltage that opposes the applied EMF

A-001-001-006 (C)

After two time constants, the capacitor in an RC circuit is charged to what percentage of the supply voltage?

- A 95%
- B 36.8%
- C 86.5%
- D 63.2%

A-001-001-007 (A)

After two time constants, the capacitor in an RC circuit is discharged to what percentage of the starting voltage?

- A 13.5%
- B 36.8%
- C 86.5%
- D 63.2%

A-001-001-008 (A)

What is the time constant of a circuit having a 100 microfarad capacitor in series with a 470 kilohm resistor?

- A 47 seconds
- B 4700 seconds
- C 470 seconds
- D 0.47 seconds

A-001-001-009 (D)

What is the time constant of a circuit having a 470 microfarad capacitor in series with a 470 kilohm resistor?

- A 221 000 seconds
- B 47 000 seconds
- C 470 seconds
- D 221 seconds

A-001-001-010 (C)

What is the time constant of a circuit having a 220 microfarad capacitor in series with a 470 kilohm resistor?

- A 470 seconds
- B 220 seconds
- C 103 seconds
- D 470 000 seconds

A-001-002-001 (D)

What is the result of skin effect?

- A As frequency decreases, RF current flows in a thinner layer of the conductor, closer to the surface
- B Thermal effects on the surface of the conductor increase impedance
- C Thermal effects on the surface of the conductor decrease impedance
- D As frequency increases, RF current flows in a thinner layer of the conductor, closer to the surface

A-001-002-002 (C)

What effect causes most of an RF current to flow along the surface of a conductor?

- A Resonance effect
- B Layer effect
- C Skin effect
- D Piezoelectric effect

A-001-002-003 (D)

Where does almost all RF current flow in a conductor?

- A In a magnetic field in the centre of the conductor
- B In a magnetic field around the conductor
- C In the centre of the conductor
- D Along the surface of the conductor

A-001-002-004 (D)

Why does most of an RF current flow within a very thin layer under the conductor's surface?

- A Because the RF resistance of a conductor is much less than the DC resistance
- B Because a conductor has AC resistance due to self-inductance
- C Because of heating of the conductor's interior
- D Because of skin effect

A-001-002-005 (B)

Why is the resistance of a conductor different for RF currents than for direct currents?

- A Because the insulation conducts current at high frequencies
- B Because of skin effect
- C Because of the Hertzberg effect
- D Because conductors are non-linear devices

A-001-002-006 (C)

What unit measures the ability of a capacitor to store electrical charge?

- A Watt
- B Volt
- C Farad
- D Coulomb

A-001-002-007 (B)

A wire has a current passing through it. Surrounding this wire there is:

- A a skin effect that diminishes with distance
- B an electromagnetic field
- C an electrostatic field
- D a cloud of electrons

A-001-002-008 (C)

In what direction is the magnetic field oriented about a conductor in relation to the direction of electron flow?

- A In the same direction as the current
- B In the direct opposite to the current
- C In the direction determined by the left-hand rule
- D In all directions

A-001-002-009 (A)

What is the term for energy that is stored in an electromagnetic or electrostatic field?

- A Potential energy
- B Kinetic energy
- C Ampere-joules
- D Joule-coulombs

A-001-002-010 (D)

Between the charged plates of a capacitor there is:

- A a magnetic field
- B a cloud of electrons
- C an electric current
- D an electrostatic field

A-001-002-011 (D)

Energy is stored within an inductor that is carrying a current. The amount of energy depends on this current, but it also depends on a property of the inductor. This property has the following unit:

- A coulomb
- B farad
- C watt
- D henry

A-001-003-001 (A)

What is the resonant frequency of a series RLC circuit if R is 47 ohms, L is 50 microhenrys and C is 40 picofarads?

- A 3.56 MHz
- B 1.78 MHz
- C 7.96 MHz
- D 79.6 MHz

A-001-003-002 (B)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 40 microhenrys and C is 200 picofarads?

- A 1.78 kHz
- B 1.78 MHz
- C 1.99 kHz
- D 1.99 MHz

A-001-003-003 (B)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 50 microhenrys and C is 10 picofarads?

- A 3.18 kHz
- B 7.12 MHz
- C 7.12 kHz
- D 3.18 MHz

A-001-003-004 (C)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 25 microhenrys and C is 10 picofarads?

- A 10.1 kHz
- B 63.7 kHz
- C 10.1 MHz
- D 63.7 MHz

A-001-003-005 (D)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 3 microhenrys and C is 40 picofarads?

- A 13.1 MHz
- B 13.1 kHz
- C 14.5 kHz
- D 14.5 MHz

A-001-003-006 (C)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 4 microhenrys and C is 20 picofarads?

- A 19.9 kHz
- B 17.8 kHz
- C 17.8 MHz
- D 19.9 MHz

A-001-003-007 (C)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 8 microhenrys and C is 7 picofarads?

- A 2.84 MHz
- B 2.13 MHz
- C 21.3 MHz
- D 28.4 MHz

A-001-003-008 (A)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 3 microhenrys and C is 15 picofarads?

- A 23.7 MHz
- B 35.4 MHz
- C 35.4 kHz
- D 23.7 kHz

A-001-003-009 (B)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 4 microhenrys and C is 8 picofarads?

- A 28.1 kHz
- B 28.1 MHz
- C 49.7 MHz
- D 49.7 kHz

A-001-003-010 (B)

What is the resonant frequency of a series RLC circuit, if R is 47 ohms, L is 1 microhenry and C is 9 picofarads?

- A 1.77 MHz
- B 53.1 MHz
- C 5.31 MHz
- D 17.7 MHz

A-001-003-011 (C)

What is the value of capacitance (C) in a series R-L-C circuit, if the circuit resonant frequency is 14.25 MHz and L is 2.84 microhenrys?

- A 44 microfarads
- B 2.2 picofarads
- C 44 picofarads
- D 2.2 microfarads

A-001-004-001 (D)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 1 microhenry and C is 10 picofarads?

- A 15.9 kHz
- B 50.3 kHz
- C 15.9 MHz
- D 50.3 MHz

A-001-004-002 (C)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 2 microhenrys and C is 15 picofarads?

- A 5.31 MHz
- B 5.31 kHz
- C 29.1 MHz
- D 29.1 kHz

A-001-004-003 (C)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 5 microhenrys and C is 9 picofarads?

- A 3.54 MHz
- B 3.54 kHz
- C 23.7 MHz
- D 23.7 kHz

A-001-004-004 (D)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 2 microhenrys and C is 30 picofarads?

- A 2.65 MHz
- B 2.65 kHz
- C 20.5 kHz
- D 20.5 MHz

A-001-004-005 (A)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 15 microhenrys and C is 5 picofarads?

- A 18.4 MHz
- B 2.12 kHz
- C 2.12 MHz
- D 18.4 kHz

A-001-004-006 (A)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 3 microhenrys and C is 40 picofarads?

- A 14.5 MHz
- B 1.33 kHz
- C 1.33 MHz
- D 14.5 kHz

A-001-004-007 (C)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 40 microhenrys and C is 6 picofarads?

- A 6.63 kHz
- B 10.3 kHz
- C 10.3 MHz
- D 6.63 MHz

A-001-004-008 (A)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 10 microhenrys and C is 50 picofarads?

- A 7.12 MHz
- B 7.12 kHz
- C 3.18 MHz
- D 3.18 kHz

A-001-004-009 (C)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 200 microhenrys and C is 10 picofarads?

- A 7.96 MHz
- B 7.96 kHz
- C 3.56 MHz
- D 3.56 kHz

A-001-004-010 (D)

What is the resonant frequency of a parallel RLC circuit if R is 4.7 kilohms, L is 90 microhenrys and C is 100 picofarads?

- A 1.77 kHz
- B 1.77 MHz
- C 1.68 kHz
- D 1.68 MHz

A-001-004-011 (B)

What is the value of inductance (L) in a parallel RLC circuit, if the resonant frequency is 14.25 MHz and C is 44 picofarads?

- A 0.353 microhenry
- B 2.8 microhenrys
- C 253.8 millihenrys
- D 3.9 millihenrys

A-001-005-001 (D)

What is the Q of a parallel RLC circuit, if it is resonant at 14.128 MHz, L is 2.7 microhenrys and R is 18 kilohms?

- A 7.51
- B 0.013
- C 71.5
- D 75.1

A-001-005-002 (C)

What is the Q of a parallel RLC circuit, if it is resonant at 14.128 MHz, L is 4.7 microhenrys and R is 18 kilohms?

- A 0.023
- B 4.31
- C 43.1
- D 13.3

A-001-005-003 (C)

What is the Q of a parallel RLC circuit, if it is resonant at 4.468 MHz, L is 47 microhenrys and R is 180 ohms?

- A 0.00735
- B 13.3
- C 0.136
- D 7.35

A-001-005-004 (A)

What is the Q of a parallel RLC circuit, if it is resonant at 14.225 MHz, L is 3.5 microhenrys and R is 10 kilohms?

- A 31.9
- B 7.35
- C 0.0319
- D 71.5

A-001-005-005 (C)

What is the Q of a parallel RLC circuit, if it is resonant at 7.125 MHz, L is 8.2 microhenrys and R is 1 kilohm?

- A 0.368
- B 0.273
- C 2.73
- D 36.8

A-001-005-006 (D)

What is the Q of a parallel RLC circuit, if it is resonant at 7.125 MHz, L is 10.1 microhenrys and R is 100 ohms?

- A 22.1
- B 0.00452
- C 4.52
- D 0.221

A-001-005-007 (B)

What is the Q of a parallel RLC circuit, if it is resonant at 7.125 MHz, L is 12.6 microhenrys and R is 22 kilohms?

- A 25.6
- B 39
- C 22.1
- D 0.0256

A-001-005-008 (B)

What is the Q of a parallel RLC circuit, if it is resonant at 3.625 MHz, L is 3 microhenrys and R is 2.2 kilohms?

- A 0.031
- B 32.2
- C 25.6
- D 31.1

A-001-005-009 (B)

What is the Q of a parallel RLC circuit, if it is resonant at 3.625 MHz, L is 42 microhenrys and R is 220 ohms?

- A 0.00435
- B 0.23
- C 2.3
- D 4.35

A-001-005-010 (A)

What is the Q of a parallel RLC circuit, if it is resonant at 3.625 MHz, L is 43 microhenrys and R is 1.8 kilohms?

- A 1.84
- B 0.543
- C 54.3
- D 23

A-001-005-011 (D)

Why is a resistor often included in a parallel resonant circuit ?

- A To increase the Q and decrease the skin effect
- B To decrease the Q and increase the resonant frequency
- C To increase the Q and decrease bandwidth
- D To decrease the Q and increase the bandwidth

A-002-001-001 (B)

What two elements widely used in semiconductor devices exhibit both metallic and non-metallic characteristics?

- A Silicon and gold
- B Silicon and germanium
- C Galena and germanium
- D Galena and bismuth

A-002-001-002 (B)

In what application is gallium-arsenide used as a semiconductor material in preference to germanium or silicon?

- A In bipolar transistors
- B At microwave frequencies
- C In high-power circuits
- D At very low frequencies

A-002-001-003 (B)

What type of semiconductor material contains fewer free electrons than pure germanium or silicon crystals?

- A Superconductor type
- B P-type
- C N-type
- D Bipolar type

A-002-001-004 (C)

What type of semiconductor material contains more free electrons than pure germanium or silicon crystals?

- A Bipolar
- B Superconductor
- C N-type
- D P-type

A-002-001-005 (C)

What are the majority charge carriers in P-type semiconductor material?

- A Free protons
- B Free neutrons
- C Holes
- D Free electrons

A-002-001-006 (C)

What are the majority charge carriers in N-type semiconductor material?

- A Free protons
- B Free neutrons
- C Free electrons
- D Holes

A-002-001-007 (C)

Silicon, in its pure form, is:

- A a semiconductor
- B a conductor
- C an insulator
- D a superconductor

A-002-001-008 (B)

An element which is sometimes an insulator and sometimes a conductor is called a:

- A P-type conductor
- B semiconductor
- C intrinsic conductor
- D N-type conductor

A-002-001-009 (D)

Which of the following materials is used to make a semiconductor?

- A Tantalum
- B Copper
- C Sulphur
- D Silicon

A-002-001-010 (D)

Substances such as silicon in a pure state are usually good:

- A conductors
- B tuned circuits
- C inductors
- D insulators

A-002-001-011 (A)

A semiconductor is said to be doped when it has added to it small quantities of:

- A impurities
- B protons
- C ions
- D electrons

A-002-002-001 (C)

What is the principal characteristic of a Zener diode?

- A A negative resistance region
- B An internal capacitance that varies with the applied voltage
- C A constant voltage under conditions of varying current
- D A constant current under conditions of varying voltage

A-002-002-002 (B)

What type of semiconductor diode varies its internal capacitance as the voltage applied to its terminals varies?

- A Hot-carrier (Schottky)
- B Varactor
- C Zener
- D Silicon-controlled rectifier

A-002-002-003 (A)

What is a common use for the hot-carrier (Schottky) diode?

- A As VHF and UHF mixers and detectors
- B As balanced mixers in FM generation
- C As a variable capacitance in an automatic frequency control (AFC) circuit
- D As a constant voltage reference in a power supply

A-002-002-004 (D)

What limits the maximum forward current in a junction diode?

- A Forward voltage
- B Back EMF
- C Peak inverse voltage
- D Junction temperature

A-002-002-005 (D)

What are the major ratings for junction diodes?

- A Maximum reverse current and capacitance
- B Maximum forward current and capacitance
- C Maximum reverse current and peak inverse voltage (PIV)
- D Maximum forward current and peak inverse voltage (PIV)

A-002-002-006 (B)

Structurally, what are the two main categories of semiconductor diodes?

- A Electrolytic and junction
- B Junction and point contact
- C Vacuum and point contact
- D Electrolytic and point contact

A-002-002-007 (B)

What is a common use for point contact diodes?

- A As a high voltage rectifier
- B As an RF detector
- C As a constant current source
- D As a constant voltage source

A-002-002-008 (C)

What is one common use for PIN diodes?

- A As a high voltage rectifier
- B As a constant voltage source
- C As an RF switch
- D As a constant current source

A-002-002-009 (C)

A Zener diode is a device used to:

- A decrease current
- B increase current
- C regulate voltage
- D dissipate voltage

A-002-002-010 (B)

If a Zener diode rated at 10 V and 50 watts was operated at maximum dissipation rating, it would conduct \_\_\_\_\_ amperes:

- A 0.5
- B 5
- C 50
- D 0.05

A-002-002-011 (D)

The power-handling capability of most Zener diodes is rated at 25 degrees C or approximately room temperature. If the temperature is increased, the power handling capability is:

- A the same
- B much greater
- C slightly greater
- D less

A-002-003-001 (C)

What is the alpha of a bipolar transistor?

- A The change of base current with respect to collector current
- B The change of collector current with respect to gate current
- C The change of collector current with respect to emitter current
- D The change of collector current with respect to base current

A-002-003-002 (B)

What is the beta of a bipolar transistor?

- A The change of base current with respect to gate current
- B The change of collector current with respect to base current
- C The change of base current with respect to emitter current
- D The change of collector current with respect to emitter current

A-002-003-003 (B)

Which component conducts electricity from a negative emitter to a positive collector when its base voltage is made positive?

- A A PNP transistor
- B An NPN transistor
- C A varactor
- D A triode vacuum tube

A-002-003-004 (C)

What is the alpha of a bipolar transistor in common base configuration?

- A Reverse current gain
- B Reverse voltage gain
- C Forward current gain
- D Forward voltage gain

A-002-003-005 (D)

In a bipolar transistor, the change of collector current with respect to base current is called:

- A gamma
- B delta
- C alpha
- D beta

A-002-003-006 (C)

The alpha of a bipolar transistor is specified for what configuration?

- A Common gate
- B Common emitter
- C Common base
- D Common collector

A-002-003-007 (C)

The beta of a bipolar transistor is specified for what configurations?

- A Common base or common collector
- B Common base or common emitter
- C Common emitter or common collector
- D Common emitter or common gate

A-002-003-008 (D)

Which component conducts electricity from a positive emitter to a negative collector when its base is made negative?

- A A triode vacuum tube
- B A varactor
- C An NPN transistor
- D A PNP transistor

A-002-003-009 (C)

Alpha of a bipolar transistor is equal to:

- A  $\beta \times (1 - \beta)$
- B  $\beta / (1 - \beta)$
- C  $\beta / (1 + \beta)$
- D  $\beta \times (1 + \beta)$

A-002-003-010 (D)

The current gain of a bipolar transistor in common emitter or common collector compared to common base configuration is:

- A very low
- B usually about double
- C usually about half
- D high to very high

A-002-003-011 (A)

Beta of a bipolar transistor is equal to:

- A  $\alpha / (1 - \alpha)$
- B  $\alpha / (1 + \alpha)$
- C  $\alpha \times (1 - \alpha)$
- D  $\alpha \times (1 + \alpha)$

A-002-004-001 (D)

What is an enhancement-mode FET?

- A An FET with a channel that blocks voltage through the gate
- B An FET with a channel that allows current when the gate voltage is zero
- C An FET without a channel to hinder current through the gate
- D An FET without a channel; no current occurs with zero gate voltage

A-002-004-002 (C)

What is a depletion-mode FET?

- A An FET without a channel to hinder current through the gate
- B An FET that has a channel that blocks current when the gate voltage is zero
- C An FET that has a channel with no gate voltage applied; a current flows with zero gate voltage
- D An FET without a channel; no current flows with zero gate voltage

A-002-004-003 (D)

Why do many MOSFET devices have built-in gate protective Zener diodes?

- A The gate-protective Zener diode keeps the gate voltage within specifications to prevent the device from overheating
- B The gate-protective Zener diode protects the substrate from excessive voltages
- C The gate-protective Zener diode provides a voltage reference to provide the correct amount of reverse-bias gate voltage
- D The gate-protective Zener diode prevents the gate insulation from being punctured by small static charges or excessive voltages

A-002-004-004 (A)

Why are special precautions necessary in handling FET and CMOS devices?

- A They are susceptible to damage from static charges
- B They are light-sensitive
- C They have micro-welded semiconductor junctions that are susceptible to breakage
- D They have fragile leads that may break off

A-002-004-005 (A)

How does the input impedance of a field-effect transistor (FET) compare with that of a bipolar transistor?

- A An FET has high input impedance; a bipolar transistor has low input impedance
- B One cannot compare input impedance without knowing supply voltage
- C An FET has low input impedance; a bipolar transistor has high input impedance
- D The input impedance of FETs and bipolar transistors is the same

A-002-004-006 (B)

What are the three terminals of a junction field-effect transistor (JFET)?

- A Gate 1, gate 2, drain
- B Gate, drain, source
- C Emitter, base 1, base 2
- D Emitter, base, collector

A-002-004-007 (D)

What are the two basic types of junction field-effect transistors (JFET)?

- A High power and low power
- B MOSFET and GaAsFET
- C Silicon and germanium
- D N-channel and P-channel

A-002-004-008 (C)

Electron conduction in an n-channel depletion type MOSFET is associated with:

- A p-channel enhancement
- B q-channel enhancement
- C n-channel depletion
- D p-channel depletion

A-002-004-009 (D)

Electron conduction in an n-channel enhancement MOSFET is associated with:

- A q-channel depletion
- B p-channel enhancement
- C p-channel depletion
- D n-channel enhancement

A-002-004-010 (C)

Hole conduction in a p-channel depletion type MOSFET is associated with:

- A q-channel depletion
- B n-channel depletion
- C p-channel depletion
- D n-channel enhancement

A-002-004-011 (A)

Hole conduction in a p-channel enhancement type MOSFET is associated with:

- A p-channel enhancement
- B n-channel depletion
- C n-channel enhancement
- D q-channel depletion

A-002-005-001 (D)

What are the three terminals of a silicon controlled rectifier (SCR)?

- A Gate, base 1 and base 2
- B Base, collector and emitter
- C Gate, source and sink
- D Anode, cathode and gate

A-002-005-002 (D)

What are the two stable operating conditions of a silicon controlled rectifier (SCR)?

- A Forward conducting and reverse conducting
- B NPN conduction and PNP conduction
- C Oscillating and quiescent
- D Conducting and non-conducting

A-002-005-003 (D)

When a silicon controlled rectifier (SCR) is triggered, to what other semiconductor diode are its electrical characteristics similar (as measured between its cathode and anode)?

- A The PIN diode
- B The hot-carrier (Schottky) diode
- C The varactor diode
- D The junction diode

A-002-005-004 (D)

Under what operating condition does a silicon controlled rectifier (SCR) exhibit electrical characteristics similar to a forward-biased silicon rectifier?

- A When it is gated "off"
- B When it is used as a detector
- C During a switching transition
- D When it is gated "on"

A-002-005-005 (D)

The silicon controlled rectifier (SCR) is what type of device?

- A NPPN
- B PNNP
- C PPNN
- D PNPN

A-002-005-006 (D)

The control element in the silicon controlled rectifier (SCR) is called the:

- A anode
- B cathode
- C emitter
- D gate

A-002-005-007 (A)

The silicon controlled rectifier (SCR) is a member of which family?

- A Thyristors
- B Phase locked loops
- C Varactors
- D Varistors

A-002-005-008 (A)

In amateur radio equipment, which is the major application for the silicon controlled rectifier (SCR)?

- A Power supply overvoltage "crowbar" circuit
- B Class C amplifier circuit
- C Microphone preamplifier circuit
- D SWR detector circuit

A-002-005-009 (B)

Which of the following devices has anode, cathode, and gate?

- A The triode vacuum tube
- B The silicon controlled rectifier (SCR)
- C The bipolar transistor
- D The field effect transistor

A-002-005-010 (D)

When it is gated "on", the silicon controlled rectifier (SCR) exhibits electrical characteristics similar to a:

- A reverse-biased silicon rectifier
- B forward-biased PIN diode
- C reverse-biased hot-carrier (Schottky) diode
- D forward-biased silicon rectifier

A-002-005-011 (B)

Which of the following is a PNPN device?

- A Zener diode
- B Silicon controlled rectifier (SCR)
- C PIN diode
- D Hot carrier (Schottky) diode

A-002-006-001 **(B)**

For what portion of a signal cycle does a Class A amplifier operate?

- A Less than 180 degrees
- B The entire cycle
- C Exactly 180 degrees
- D More than 180 degrees but less than 360 degrees

A-002-006-002 **(C)**

Which class of amplifier has the highest linearity and least distortion?

- A Class B
- B Class C
- C Class A
- D Class AB

A-002-006-003 **(C)**

For what portion of a cycle does a Class AB amplifier operate?

- A The entire cycle
- B Less than 180 degrees
- C More than 180 degrees but less than 360 degrees
- D Exactly 180 degrees

A-002-006-004 **(B)**

For what portion of a cycle does a Class B amplifier operate?

- A The entire cycle
- B 180 degrees
- C Less than 180 degrees
- D More than 180 degrees but less than 360 degrees

A-002-006-005 **(C)**

For what portion of a signal cycle does a Class C amplifier operate?

- A The entire cycle
- B 180 degrees
- C Less than 180 degrees
- D More than 180 degrees but less than 360 degrees

A-002-006-006 **(B)**

Which of the following classes of amplifier provides the highest efficiency?

- A Class B
- B Class C
- C Class A
- D Class AB

A-002-006-007 **(C)**

Which of the following classes of amplifier would provide the highest efficiency in the output stage of a CW, RTTY or FM transmitter?

- A Class B
- B Class A
- C Class C
- D Class AB

A-002-006-008 **(B)**

Which class of amplifier provides the least efficiency?

- A Class AB
- B Class A
- C Class C
- D Class B

A-002-006-009 **(D)**

Which class of amplifier has the poorest linearity and the most distortion?

- A Class AB
- B Class A
- C Class B
- D Class C

A-002-006-010 **(A)**

Which class of amplifier operates over the full cycle?

- A Class A
- B Class AB
- C Class B
- D Class C

A-002-006-011 (C)

Which class of amplifier operates over less than 180 degrees of the cycle?

- A Class A
- B Class B
- C Class C
- D Class AB

A-002-007-001 (D)

What determines the input impedance of a FET common-source amplifier?

- A The input impedance is essentially determined by the resistance between the source and substrate
- B The input impedance is essentially determined by the resistance between the source and the drain
- C The input impedance is essentially determined by the resistance between the drain and substrate
- D The input impedance is essentially determined by the gate biasing network

A-002-007-002 (B)

What determines the output impedance of a FET common-source amplifier?

- A The output impedance is essentially determined by the input impedance of the FET
- B The output impedance is essentially determined by the drain resistor
- C The output impedance is essentially determined by the drain supply voltage
- D The output impedance is essentially determined by the gate supply voltage

A-002-007-003 (B)

What are the advantages of a Darlington pair audio amplifier?

- A Low output impedance, high mutual impedance and low output current
- B High gain, high input impedance and low output impedance
- C Mutual gain, high stability and low mutual inductance
- D Mutual gain, low input impedance and low output impedance

A-002-007-004 (D)

In the common base amplifier, when the input and output signals are compared:

- A the output signal lags the input signal by 90 degrees
- B the output signals leads the input signal by 90 degrees
- C the signals are 180 degrees out of phase
- D the signals are in phase

A-002-007-005 (A)

In the common base amplifier, the input impedance, when compared to the output impedance is:

- A very low
- B only slightly higher
- C only slightly lower
- D very high

A-002-007-006 (D)

In the common emitter amplifier, when the input and output signals are compared:

- A the output signal leads the input signal by 90 degrees
- B the output signal lags the input signal by 90 degrees
- C the signals are in phase
- D the signals are 180 degrees out of phase

A-002-007-007 (B)

In the common collector amplifier, when the input and output signals are compared:

- A the signals are 180 degrees out of phase
- B the signals are in phase
- C the output signal leads the input signal by 90 degrees
- D the output signal lags the input signal by 90 degrees

A-002-007-008 (C)

The FET amplifier source follower circuit is another name for:

- A common mode circuit
- B common gate circuit
- C common drain circuit
- D common source circuit

A-002-007-009 (D)

The FET amplifier common source circuit is similar to which of the following bipolar transistor amplifier circuits?

- A Common collector
- B Common base
- C Common mode
- D Common emitter

A-002-007-010 (D)

The FET amplifier common drain circuit is similar to which of the following bipolar transistor amplifier circuits?

- A Common emitter
- B Common base
- C Common mode
- D Common collector

A-002-007-011 (B)

The FET amplifier common gate circuit is similar to which of the following bipolar transistor amplifier circuits?

- A Common emitter
- B Common base
- C Common mode
- D Common collector

A-002-008-001 (B)

What is an operational amplifier (op-amp)?

- A A program subroutine that calculates the gain of an RF amplifier
- B A high-gain, direct-coupled differential amplifier whose characteristics are determined by components mounted externally
- C A high-gain, direct-coupled audio amplifier whose characteristics are determined by internal components of the device
- D An amplifier used to increase the average output of frequency modulated amateur signals to the legal limit

A-002-008-002 (C)

What would be the characteristics of the ideal op-amp?

- A Infinite input impedance, infinite output impedance, infinite gain and flat frequency response
- B Zero input impedance, infinite output impedance, infinite gain, and flat frequency response
- C Infinite input impedance, zero output impedance, infinite gain, and flat frequency response
- D Zero input impedance, zero output impedance, infinite gain, and flat frequency response

A-002-008-003 (C)

What determines the gain of a closed-loop op-amp circuit?

- A The voltage applied to the circuit
- B The collector-to-base capacitance of the PNP stage
- C The external feedback network
- D The PNP collector load

A-002-008-004 (A)

What is meant by the term op-amp offset voltage?

- A The potential between the amplifier input terminals of the op-amp in a closed-loop condition
- B The difference between the output voltage of the op-amp and the input voltage required for the next stage
- C The potential between the amplifier input terminals of the op-amp in an open-loop condition
- D The output voltage of the op-amp minus its input voltage

A-002-008-005 (C)

What is the input impedance of a theoretically ideal op-amp?

- A Exactly 100 ohms
- B Exactly 1000 ohms
- C Very high
- D Very low

A-002-008-006 (D)

What is the output impedance of a theoretically ideal op-amp?

- A Very high
- B Exactly 100 ohms
- C Exactly 1000 ohms
- D Very low

A-002-008-007 (A)

What are the advantages of using an op-amp instead of LC elements in an audio filter?

- A Op-amps exhibit gain rather than insertion loss
- B Op-amps are more rugged and can withstand more abuse than can LC elements
- C Op-amps are available in more styles and types than are LC elements
- D Op-amps are fixed at one frequency

A-002-008-008 (B)

What are the principal uses of an op-amp RC active filter in amateur circuitry?

- A Op-amp circuits are used as high-pass filters to block RFI at the input of receivers
- B Op-amp circuits are used as audio filters for receivers
- C Op-amp circuits are used as low-pass filters at the output of transmitters
- D Op-amp circuits are used as filters for smoothing power supply output

A-002-008-009 (B)

What is an inverting op-amp circuit?

- A An operational amplifier circuit connected such that the input impedance is held to zero, while the output impedance is high
- B An operational amplifier circuit connected such that the input and output signals are 180 degrees out of phase
- C An operational amplifier circuit connected such that the input and output signals are in phase
- D An operational amplifier circuit connected such that the input and output signals are 90 degrees out of phase

A-002-008-010 (B)

What is a non-inverting op-amp circuit?

- A An operational amplifier circuit connected such that the input and output signals are 180 degrees out of phase
- B An operational amplifier circuit connected such that the input and output signals are in phase
- C An operational amplifier circuit connected such that the input and output signals are 90 degrees out of phase
- D An operational amplifier circuit connected such that the input impedance is held low, and the output impedance is high

A-002-008-011 (C)

What term is most appropriate for a high gain, direct-coupled differential amplifier whose characteristics are determined by components mounted externally?

- A High gain audio amplifier
- B Summing amplifier
- C Operational amplifier
- D Difference amplifier

A-002-009-001 (D)

What is the mixing process?

- A The elimination of noise in a wideband receiver by phase differentiation
- B The recovery of intelligence from a modulated signal
- C The elimination of noise in a wideband receiver by phase comparison
- D The combination of two signals to produce sum and difference frequencies

A-002-009-002 (B)

What are the principal frequencies that appear at the output of a mixer circuit?

- A Two and four times the original frequency
- B The original frequencies and the sum and difference frequencies
- C 1.414 and 0.707 times the input frequencies
- D The sum, difference and square root of the input frequencies

A-002-009-003 (C)

What occurs when an excessive amount of signal energy reaches the mixer circuit?

- A A beat frequency is generated
- B Mixer blanking occurs
- C Spurious signals are generated
- D Automatic limiting occurs

A-002-009-004 (B)

In a frequency multiplier circuit, the input signal is coupled to the base of a transistor through a capacitor. A radio frequency choke is connected between the base of the transistor and ground. The capacitor is:

- A part of the output tank circuit
- B a DC blocking capacitor
- C part of the input tuned circuit
- D a by-pass for the circuit

A-002-009-005 (D)

A frequency multiplier circuit must be operated in:

- A class AB
- B class B
- C class A
- D class C

A-002-009-006 (A)

In a frequency multiplier circuit, an inductance (L1) and a variable capacitor (C2) are connected in series between VCC+ and ground. The collector of a transistor is connected to a tap on L1. The purpose of the variable capacitor is to:

- A tune L1 to the desired harmonic
- B by-pass RF
- C tune L1 to the frequency applied to the base
- D provide positive feedback

A-002-009-007 (B)

In a frequency multiplier circuit, an inductance (L1) and a variable capacitor (C2) are connected in series between VCC+ and ground. The collector of a transistor is connected to a tap on L1. A fixed capacitor (C3) is connected between the VCC+ side of L1 and ground. The purpose of C3 is to:

- A by-pass any audio components
- B provide an RF ground at the VCC connection point of L1
- C form a pi filter with L1 and C2
- D resonate with L1

A-002-009-008 (C)

In a frequency multiplier circuit, an inductance (L1) and a variable capacitor (C2) are connected in series between VCC+ and ground. The collector of a transistor is connected to a tap on L1. C2 in conjunction with L1 operate as a:

- A voltage divider
- B voltage doubler
- C frequency multiplier
- D frequency divider

A-002-009-009 (A)

In a circuit where the components are tuned to resonate at a higher frequency than applied, the circuit is most likely a:

- A a frequency multiplier
- B a VHF/UHF amplifier
- C a linear amplifier
- D a frequency divider

A-002-009-010 (D)

In a frequency multiplier circuit, an inductance (L1) and a variable capacitor (C2) are connected in series between VCC+ and ground. The collector of a transistor is connected to a tap on L1. A fixed capacitor (C3) is connected between the VCC+ side of L1 and ground. C3 is a:

- A DC blocking capacitor
- B tuning capacitor
- C coupling capacitor
- D RF by-pass capacitor

A-002-009-011 (D)

What stage in a transmitter would change a 5.3-MHz input signal to 14.3 MHz?

- A A linear translator
- B A frequency multiplier
- C A beat frequency oscillator
- D A mixer

A-002-010-001 (C)

What is a NAND gate?

- A A circuit that produces a logic "0" at its output if some but not all of its inputs are logic "1"
- B A circuit that produces a logic "0" at its output only when all inputs are logic "0"
- C A circuit that produces a logic "0" at its output only when all inputs are logic "1"
- D A circuit that produces a logic "1" at its output only when all inputs are logic "1"

A-002-010-002 (B)

What is an OR gate?

- A A circuit that produces a logic "0" at its output if any input is logic "1"
- B A circuit that produces a logic "1" at its output if any input is logic "1"
- C A circuit that produces a logic "0" at its output if all inputs are logic "1"
- D A circuit that produces logic "1" at its output if all inputs are logic "0"

A-002-010-003 (B)

What is a NOR gate?

- A A circuit that produces a logic "1" at its output if some but not all of its inputs are logic "1"
- B A circuit that produces a logic "0" at its output if any or all inputs are logic "1"
- C A circuit that produces a logic "0" at its output only if all inputs are logic "0"
- D A circuit that produces a logic "1" at its output only if all inputs are logic "1"

A-002-010-004 (C)

What is a NOT gate (also known as an INVERTER)?

- A A circuit that allows data transmission only when its input is high
- B A circuit that produces a logic "1" at its output when the input is logic "1"
- C A circuit that produces a logic "0" at its output when the input is logic "1"
- D A circuit that does not allow data transmission when its input is high

A-002-010-005 (A)

What is an EXCLUSIVE OR gate?

- A A circuit that produces a logic "1" at its output when only one of the inputs is logic "1"
- B A circuit that produces a logic "0" at its output when only one of the inputs is logic "1"
- C A circuit that produces a logic "1" at its output when all of the inputs are logic "1"
- D A circuit that produces a logic "1" at its output when all of the inputs are logic "0"

A-002-010-006 (B)

What is an EXCLUSIVE NOR gate?

- A A circuit that produces a logic "0" at its output when all of the inputs are logic "1"
- B A circuit that produces a logic "1" at its output when all of the inputs are logic "1"
- C A circuit that produces a logic "1" at its output when only one of the inputs is logic "0"
- D A circuit that produces a logic "1" at its output when only one of the inputs are logic "1"

A-002-010-007 (B)

What is an AND gate?

- A A circuit that produces a logic "1" at its output if all inputs are logic "0"
- B A circuit that produces a logic "1" at its output only if all its inputs are logic "1"
- C A circuit that produces a logic "1" at the output if at least one input is a logic "0"
- D A circuit that produces a logic "1" at its output only if one of its inputs is logic "1"

A-002-010-008 (D)

What is a flip-flop circuit?

- A A binary sequential logic element with eight stable states
- B A binary sequential logic element with four stable states
- C A binary sequential logic element with one stable state
- D A binary sequential logic element with two stable states

A-002-010-009 (B)

What is a bistable multivibrator?

- A A clock
- B A flip-flop
- C An OR gate
- D An AND gate

A-002-010-010 (A)

What type of digital logic is also known as a latch?

- A A flip-flop
- B A decade counter
- C An OR gate
- D An op-amp

A-002-010-011 (B)

In a multivibrator circuit, when one transistor conducts, the other is:

- A forward-biased
- B cut off
- C saturated
- D reverse-biased

A-002-011-001 (D)

What is a crystal lattice filter?

- A A filter with wide bandwidth and shallow skirts made using quartz crystals
- B An audio filter made with four quartz crystals that resonate at 1 kHz intervals
- C A power supply filter made with interlaced quartz crystals
- D A filter with narrow bandwidth and steep skirts made using quartz crystals

A-002-011-002 (A)

What factor determines the bandwidth and response shape of a crystal lattice filter?

- A The relative frequencies of the individual crystals
- B The centre frequency chosen for the filter
- C The gain of the RF stage following the filter
- D The amplitude of the signals passing through the filter

A-002-011-003 (A)

For single-sideband phone emissions, what would be the bandwidth of a good crystal lattice filter?

- A 2.4 kHz
- B 15 kHz
- C 500 Hz
- D 6 kHz

A-002-011-004 (B)

The main advantage of a crystal oscillator over a tuned LC oscillator is:

- A simplicity
- B much greater frequency stability
- C longer life under severe operating use
- D freedom from harmonic emissions

A-002-011-005 (C)

A quartz crystal filter is superior to an LC filter for narrow bandpass applications because of the:

- A LC circuit's high Q
- B crystal's simplicity
- C crystal's high Q
- D crystal's low Q

A-002-011-006 (B)

Piezoelectricity is generated by:

- A moving a magnet near a crystal
- B deforming certain crystals
- C touching crystals with magnets
- D adding impurities to a crystal

A-002-011-007 **(B)**

Electrically, what does a crystal look like?

- A A variable tuned circuit
- B A very high Q tuned circuit
- C A very low Q tuned circuit
- D A variable capacitance

A-002-011-008 **(C)**

Crystals are sometimes used in a circuit which has an output close to an integral multiple of the crystal frequency. This circuit is called:

- A a crystal lattice
- B a crystal ladder
- C an overtone oscillator
- D a crystal multiplier

A-002-011-009 **(D)**

Which of the following properties does not apply to a crystal when used in an oscillator circuit?

- A Good frequency stability
- B Very low noise because of high Q
- C Good frequency accuracy
- D High power output

A-002-011-010 **(A)**

Crystal oscillators, filters and microphones depend upon which principle?

- A Piezoelectric effect
- B Hertzberg effect
- C Ferro-resonance
- D Overtone effect

A-002-011-011 **(A)**

Crystals are not applicable to which of the following?

- A Active filters
- B Microphones
- C Lattice filters
- D Oscillators

A-002-012-001 **(D)**

What are the three general groupings of filters?

- A Hartley, Colpitts and Pierce
- B Audio, radio and capacitive
- C Inductive, capacitive and resistive
- D High-pass, low-pass and band-pass

A-002-012-002 **(C)**

What are the distinguishing features of a Butterworth filter?

- A It only requires conductors
- B It only requires capacitors
- C It has a maximally flat response over its pass-band
- D The product of its series and shunt-element impedances is a constant for all frequencies

A-002-012-003 **(D)**

Which filter type is described as having ripple in the passband and a sharp cutoff?

- A An active LC filter
- B A passive op-amp filter
- C A Butterworth filter
- D A Chebyshev filter

A-002-012-004 **(A)**

What are the distinguishing features of a Chebyshev filter?

- A It allows ripple in the passband in return for steeper skirts
- B It requires only inductors
- C It requires only capacitors
- D It has a maximally flat response in the passband

A-002-012-005 **(C)**

Resonant cavities are used by amateurs as a:

- A low-pass filter below 30 MHz
- B high-pass filter above 30 MHz
- C narrow bandpass filter at VHF and higher frequencies
- D power line filter

A-002-012-006 (D)

On VHF and above, 1/4 wavelength coaxial cavities are used to give protection from high-level signals. For a frequency of approximately 50 MHz, the diameter of such a device would be about 10 cm (4 in). What would be its approximate length?

- A 0.6 metres (2 ft)
- B 2.4 metres (8 ft)
- C 3.7 metres (12 ft)
- D 1.5 metres (5 ft)

A-002-012-007 (D)

A device which helps with receiver overload and spurious responses at VHF, UHF and above may be installed in the receiver front end. It is called a:

- A diplexer
- B directional coupler
- C duplexer
- D helical resonator

A-002-012-008 (D)

Where you require bandwidth at VHF and higher frequencies about equal to a television channel, a good choice of filter is the:

- A resonant cavity
- B Butterworth
- C Chebyshev
- D none of the other answers

A-002-012-009 (B)

What is the primary advantage of the Butterworth filter over the Chebyshev filter?

- A It requires only capacitors
- B It has maximally flat response over its passband
- C It allows ripple in the passband in return for steeper skirts
- D It requires only inductors

A-002-012-010 (C)

What is the primary advantage of the Chebyshev filter over the Butterworth filter?

- A It requires only inductors
- B It has maximally flat response over the passband
- C It allows ripple in the passband in return for steeper skirts
- D It requires only capacitors

A-002-012-011 (C)

Which of the following filter types is not suitable for use at audio and low radio frequencies?

- A Chebyshev
- B Butterworth
- C Cavity
- D Elliptical

A-003-001-001 (A)

What is the easiest amplitude dimension to measure by viewing a pure sine wave on an oscilloscope?

- A Peak-to-peak voltage
- B Peak voltage
- C RMS voltage
- D Average voltage

A-003-001-002 (C)

What is the RMS value of a 340 volt peak-to-peak pure sine wave?

- A 240 volts
- B 300 volts
- C 120 volts
- D 170 volts

A-003-001-003 (D)

What is the equivalent to the RMS value of an AC voltage?

- A The AC voltage found by taking the square root of the peak AC voltage
- B The DC voltage causing the same heating of a given resistor as the peak AC voltage
- C The AC voltage found by taking the square root of the average AC value
- D The AC voltage causing the same heating of a given resistor as a DC voltage of the same value

A-003-001-004 (A)

If the peak value of a 100 Hz sinusoidal waveform is 20 volts, the RMS value is:

- A 14.14 volts
- B 28.28 volts
- C 7.07 volts
- D 16.38 volts

A-003-001-005 (D)

In applying Ohm's law to AC circuits, current and voltage values are:

- A average values
- B average values times 1.414
- C none of the proposed answers
- D peak values times 0.707

A-003-001-006 (C)

The effective value of a sine wave of voltage or current is:

- A 100% of the maximum value
- B 63.6% of the maximum value
- C 70.7% of the maximum value
- D 50% of the maximum value

A-003-001-007 (C)

AC voltmeter scales are usually calibrated to read:

- A instantaneous voltage
- B average voltage
- C RMS voltage
- D peak voltage

A-003-001-008 (D)

An AC voltmeter is calibrated to read the:

- A peak-to-peak value
- B average value
- C peak value
- D effective value

A-003-001-009 (C)

Which AC voltage value will produce the same amount of heat as a DC voltage, when applied to the same resistance?

- A The peak value
- B The peak-to-peak value
- C The RMS value
- D The average value

A-003-001-010 (C)

What is the peak-to-peak voltage of a sine wave that has an RMS voltage of 120 volts?

- A 169.7 volts
- B 204.8 volts
- C 339.5 volts
- D 84.8 volts

A-003-001-011 (C)

A sine wave of 17 volts peak is equivalent to how many volts RMS?

- A 34 volts
- B 8.5 volts
- C 12 volts
- D 24 volts

A-003-002-001 (C)

The power supplied to the antenna transmission line by a transmitter during an RF cycle at the highest crest of the modulation envelope is known as:

- A carrier power
- B full power
- C peak-envelope power
- D mean power

A-003-002-002 (A)

To compute one of the following, multiply the peak-envelope voltage by 0.707 to obtain the RMS value, square the result and divide by the load resistance. Which is the correct answer?

- A PEP
- B PIV
- C ERP
- D power factor

A-003-002-003 (A)

Peak-Envelope Power (PEP) for SSB transmission is:

- A Peak-Envelope Voltage (PEV) multiplied by 0.707, squared and divided by the load resistance
- B peak-voltage multiplied by peak current
- C equal to the RMS power
- D a hypothetical measurement

A-003-002-004 (D)

The formula to be used to calculate the power output of a transmitter into a resistor load using a voltmeter is:

- A  $P = EI/R$
- B  $P = EI \cos \theta$
- C  $P = IR$
- D  $P = (E \text{ exponent } 2) / R$

A-003-002-005 (B)

How is the output Peak-Envelope Power of a transmitter calculated if an oscilloscope is used to measure the Peak-Envelope Voltage across a dummy resistive load (where PEP = Peak-Envelope Power, PEV = Peak-Envelope Voltage,  $V_p$  = peak-voltage,  $R_L$  = load resistance)?

- A  $PEP = [(1.414 PEV)(1.414 PEV)] / R_L$
- B  $PEP = [(0.707 PEV)(0.707 PEV)] / R_L$
- C  $PEP = [(V_p)(V_p)] / (R_L)$
- D  $PEP = (V_p)(V_p)(R_L)$

A-003-002-006 (A)

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?

- A 100 watts
- B 400 watts
- C 1000 watts
- D 200 watts

A-003-002-007 (D)

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

- A 1250 watts
- B 2500 watts
- C 500 watts
- D 625 watts

A-003-002-008 (D)

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

- A 2120 watts
- B 1500 watts
- C 530 watts
- D 1060 watts

A-003-002-009 (B)

What is the output PEP from a transmitter, if an oscilloscope measures 400 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output?

- A 1000 watts
- B 400 watts
- C 200 watts
- D 600 watts

A-003-002-010 (D)

What is the output PEP from a transmitter, if an oscilloscope measures 800 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output?

- A 800 watts
- B 6400 watts
- C 3200 watts
- D 1600 watts

A-003-002-011 (C)

An oscilloscope measures 500 volts peak-to-peak across a 50 ohm dummy load connected to the transmitter output during unmodulated carrier conditions. What would an average-reading power meter indicate under the same transmitter conditions?

- A 884 watts
- B 442 watts
- C 625 watts
- D 427.5 watts

A-003-003-001 (A)

What is a dip meter?

- A A variable frequency oscillator with metered feedback current
- B An SWR meter
- C A marker generator
- D A field-strength meter

A-003-003-002 (A)

What does a dip meter do?

- A It gives an indication of the resonant frequency of a circuit
- B It measures transmitter output power accurately
- C It measures field strength accurately
- D It measures frequency accurately

A-003-003-003 (C)

What two ways could a dip meter be used in an amateur station?

- A To measure antenna resonance and percentage modulation
- B To measure resonant frequency of antenna traps and percentage modulation
- C To measure resonant frequencies of antenna traps and to measure a tuned circuit resonant frequency
- D To measure antenna resonance and impedance

A-003-003-004 (A)

A dip meter supplies the radio frequency energy which enables you to check:

- A the resonant frequency of a circuit
- B the calibration of an absorption-type wavemeter
- C the impedance mismatch in a circuit
- D the adjustment of an inductor

A-003-003-005 (C)

A dip meter may not be used directly to:

- A determine the frequency of oscillations
- B align receiver-tuned circuits
- C measure the value of capacitance or inductance
- D align transmitter-tuned circuits

A-003-003-006 (C)

The dial calibration on the output attenuator of a signal generator:

- A reads twice the true output when the attenuator is properly terminated
- B reads half the true output when the attenuator is properly terminated
- C reads accurately only when the attenuator is properly terminated
- D always reads the true output of the signal generator

A-003-003-007 (B)

What is a signal generator?

- A A high-stability oscillator which generates reference signals at exact frequency intervals
- B A high-stability oscillator which can produce a wide range of frequencies and amplitudes
- C A low-stability oscillator which sweeps through a range of frequencies
- D A low-stability oscillator used to inject a signal into a circuit under test

A-003-003-008 (D)

A dip meter:

- A should be tightly coupled to the circuit under test
- B may be used only with series tuned circuits
- C accurately measures frequencies
- D should be loosely coupled to the circuit under test

A-003-003-009 (A)

Which two instruments are needed to measure FM receiver sensitivity for a 12 dB SINAD ratio (signal + noise + distortion over noise + distortion)?

- A Calibrated RF signal generator with FM tone modulation and total harmonic distortion (THD) analyzer
- B RF signal generator with FM tone modulation and a deviation meter
- C Oscilloscope and spectrum analyzer
- D Receiver noise bridge and total harmonic distortion analyser

A-003-003-010 (C)

The dip meter is most directly applicable to:

- A digital logic circuits
- B series tuned circuits
- C parallel tuned circuits
- D operational amplifier circuits

A-003-003-011 (B)

Which of the following is not a factor affecting the frequency accuracy of a dip meter?

- A Over coupling
- B Transmitter power output
- C Hand capacity
- D Stray capacity

A-003-004-001 (D)

What does a frequency counter do?

- A It measures frequency deviation
- B It generates broad-band white noise for calibration
- C It produces a reference frequency
- D It makes frequency measurements

A-003-004-002 (B)

What factors limit the accuracy, frequency response and stability of a frequency counter?

- A Number of digits in the readout, external frequency reference and temperature coefficient of the logic
- B Time base accuracy, speed of the logic, and time base stability
- C Time base accuracy, temperature coefficient of the logic and time base stability
- D Number of digits in the readout, speed of the logic, and time base stability

A-003-004-003 (D)

How can the accuracy of a frequency counter be improved?

- A By using slower digital logic
- B By using faster digital logic
- C By improving the accuracy of the frequency response
- D By increasing the accuracy of the time base

A-003-004-004 (A)

If a frequency counter with a time base accuracy of +/- 0.1 PPM (parts per million) reads 146 520 000 Hz, what is the most that the actual frequency being measured could differ from that reading?

- A 14.652 Hz
- B 0.1 MHz
- C 1.4652 Hz
- D 1.4652 kHz

A-003-004-005 (C)

If a frequency counter, with a time base accuracy of 10 PPM (parts per million) reads 146 520 000 Hz, what is the most the actual frequency being measured could differ from that reading?

- A 146.52 kHz
- B 1465.2 kHz
- C 1465.2 Hz
- D 146.52 Hz

A-003-004-006 (B)

The clock in a frequency counter normally uses a:

- A free-running multivibrator
- B crystal oscillator
- C self-oscillating Hartley oscillator
- D mechanical tuning fork

A-003-004-007 (C)

The frequency accuracy of a frequency counter is determined by:

- A type of display used in the counter
- B the number of digits displayed
- C the characteristics of the internal time-base generator
- D the size of the frequency counter

A-003-004-008 (D)

Which device relies on a stable low-frequency oscillator, with harmonic output, to facilitate the frequency calibration of receiver dial settings?

- A Signal generator
- B Harmonic calibrator
- C Frequency counter
- D Frequency-marker generator

A-003-004-009 **(D)**

What is the traditional way of verifying the accuracy of a crystal calibrator?

- A Compare the oscillator with your transmitter
- B Use a dip-meter to determine the oscillator's fundamental frequency
- C Compare the oscillator with your receiver
- D Zero-beat the crystal oscillator against a standard frequency station such as WWV

A-003-004-010 **(D)**

Out of the following oscillators, one is NOT, by itself, considered a high-stability reference:

- A temperature compensated crystal oscillator (TCXO)
- B oven-controlled crystal oscillator (OCXO)
- C GPS disciplined oscillator (GPSDO)
- D voltage-controlled crystal oscillator (VCXO)

A-003-004-011 **(A)**

You want to calibrate your station frequency reference to the WWV signal on your receiver. The resulting beat tone must be:

- A of a frequency as low as possible and with a period as long as possible
- B a combined frequency above both
- C the mathematical mean of both frequencies
- D at the highest audio frequency possible

A-003-005-001 **(A)**

If a 100 Hz signal is fed to the horizontal input of an oscilloscope and a 150 Hz signal is fed to the vertical input, what type of pattern should be displayed on the screen?

- A A looping pattern with 3 horizontal loops, and 2 vertical loops
- B A rectangular pattern 100 mm wide and 150 mm high
- C An oval pattern 100 mm wide and 150 mm high
- D A looping pattern with 100 horizontal loops and 150 vertical loops

A-003-005-002 **(A)**

What factors limit the accuracy, frequency response and stability of an oscilloscope?

- A Accuracy of the time base and the linearity and bandwidth of the deflection amplifiers
- B Deflection amplifier output impedance and tube face frequency increments
- C Accuracy and linearity of the time base and tube face voltage increments
- D Tube face voltage increments and deflection amplifier voltages

A-003-005-003 **(A)**

How can the frequency response of an oscilloscope be improved?

- A By increasing the horizontal sweep rate and the vertical amplifier frequency response
- B By using a crystal oscillator as the time base and increasing the vertical sweep rate
- C By increasing the vertical sweep rate and the horizontal amplifier frequency response
- D By using triggered sweep and a crystal oscillator for the timebase

A-003-005-004 **(D)**

You can use an oscilloscope to display the input and output of a circuit at the same time by:

- A measuring the input on the X axis and the output on the Y axis
- B measuring the input on the X axis and the output on the Z axis
- C measuring the input on the Y axis and the output on the X axis
- D utilizing a dual trace oscilloscope

A-003-005-005 **(A)**

An oscilloscope cannot be used to:

- A determine FM carrier deviation directly
- B measure frequency
- C measure DC voltage
- D determine the amplitude of complex voltage wave forms

A-003-005-006 (D)

The bandwidth of an oscilloscope is:

- A directly related to gain compression
- B indirectly related to screen persistence
- C a function of the time-base accuracy
- D the highest frequency signal the scope can display

A-003-005-007 (D)

When using Lissajous figures to determine phase differences, an indication of zero or 180 degrees is represented on the screen of an oscilloscope by:

- A a horizontal straight line
- B an ellipse
- C a circle
- D a diagonal straight line

A-003-005-008 (A)

A 100-kHz signal is applied to the horizontal channel of an oscilloscope. A signal of unknown frequency is applied to the vertical channel. The resultant wave form has 5 loops displayed vertically and 2 loops horizontally. The unknown frequency is:

- A 40 kHz
- B 20 kHz
- C 50 kHz
- D 30 kHz

A-003-005-009 (B)

An oscilloscope probe must be compensated:

- A when measuring a signal whose frequency varies
- B every time the probe is used with a different oscilloscope
- C when measuring a sine wave
- D through the addition of a high-value series resistor

A-003-005-010 (C)

What is the best instrument to use to check the signal quality of a CW or single-sideband phone transmitter?

- A A signal tracer and an audio amplifier
- B A field-strength meter
- C An oscilloscope
- D A sidetone monitor

A-003-005-011 (D)

What is the best signal source to connect to the vertical input of an oscilloscope for checking the quality of a transmitted signal?

- A The RF signals of a nearby receiving antenna
- B The IF output of a monitoring receiver
- C The audio input of the transmitter
- D The RF output of the transmitter through a sampling device

A-003-006-001 (A)

A meter has a full-scale deflection of 40 microamperes and an internal resistance of 96 ohms. You want it to read 0 to 1 mA. The value of the shunt to be used is:

- A 4 ohms
- B 24 ohms
- C 16 ohms
- D 40 ohms

A-003-006-002 (D)

A moving-coil milliammeter having a full-scale deflection of 1 mA and an internal resistance of 0.5 ohms is to be converted to a voltmeter of 20 volts full-scale deflection. It would be necessary to insert a:

- A series resistance of 1 999.5 ohms
- B shunt resistance of 19 999.5 ohms
- C shunt resistance of 19.5 ohms
- D series resistance of 19 999.5 ohms

A-003-006-003 (C)

A voltmeter having a range of 150 volts and an internal resistance of 150 000 ohms is to be extended to read 750 volts. The required multiplier resistor would have a value of:

- A 750 000 ohms
- B 1 200 000 ohms
- C 600 000 ohms
- D 1 500 ohms

A-003-006-004 (B)

The sensitivity of an ammeter is an expression of:

- A the value of the shunt resistor
- B the amount of current causing full-scale deflection
- C the resistance of the meter
- D the loading effect the meter will have on a circuit

A-003-006-005 (B)

Voltmeter sensitivity is usually expressed in ohms per volt. This means that a voltmeter with a sensitivity of 20 kilohms per volt would be a:

- A 100 milliamperere meter
- B 50 microampere meter
- C 1 milliamperere meter
- D 50 milliamperere meter

A-003-006-006 (C)

The sensitivity of a voltmeter, whose resistance is 150 000 ohms on the 150-volt range, is:

- A 10 000 ohms per volt
- B 150 ohms per volt
- C 1000 ohms per volt
- D 100 000 ohms per volt

A-003-006-007 (C)

The range of a DC ammeter can easily be extended by:

- A changing the internal inductance of the meter
- B changing the internal capacitance of the meter to resonance
- C connecting an external resistance in parallel with the internal resistance
- D connecting an external resistance in series with the internal resistance

A-003-006-008 (A)

What happens inside a multimeter when you switch it from a lower to a higher voltage range?

- A Resistance is added in series with the meter
- B Resistance is reduced in series with the meter
- C Resistance is reduced in parallel with the meter
- D Resistance is added in parallel with the meter

A-003-006-009 (A)

How can the range of an ammeter be increased?

- A By adding resistance in parallel with the meter
- B By adding resistance in series with the circuit under test
- C By adding resistance in parallel with the circuit under test
- D By adding resistance in series with the meter

A-003-006-010 (C)

Where should an RF wattmeter be connected for the most accurate readings of transmitter output power?

- A One-half wavelength from the antenna feed point
- B At the antenna feed point
- C At the transmitter output connector
- D One-half wavelength from the transmitter output

A-003-006-011 (B)

At what line impedance do most RF wattmeters usually operate?

- A 300 ohms
- B 50 ohms
- C 25 ohms
- D 100 ohms

A-004-001-001 (C)

For the same transformer secondary voltage, which rectifier has the highest average output voltage?

- A Quarter-wave
- B Full-wave centre-tap
- C Bridge
- D Half-wave

A-004-001-002 (A)

In a half-wave power supply with a capacitor input filter and a load drawing little or no current, the peak inverse voltage (PIV) across the diode can reach \_\_\_\_\_ times the RMS voltage.

- A 2.8
- B 0.45
- C 5.6
- D 1.4

A-004-001-003 (D)

In a full-wave centre-tap power supply, regardless of load conditions, the peak inverse voltage (PIV) will be \_\_\_\_\_ times the RMS voltage:

- A 0.636
- B 0.707
- C 1.4
- D 2.8

A-004-001-004 (A)

A full-wave bridge rectifier circuit makes use of both halves of the AC cycle, but unlike the full-wave centre-tap rectifier circuit it does not require:

- A a centre-tapped secondary on the transformer
- B any output filtering
- C a centre-tapped primary on the transformer
- D diodes across each leg of the transformer

A-004-001-005 (A)

For a given transformer the maximum output voltage available from a full-wave bridge rectifier circuit will be:

- A double that of the full-wave centre-tap rectifier
- B half that of the full-wave centre-tap rectifier
- C the same as the full-wave centre-tap rectifier
- D the same as the half-wave rectifier

A-004-001-006 (A)

The ripple frequency produced by a full-wave power supply connected to a normal household circuit is:

- A 120 Hz
- B 60 Hz
- C 90 Hz
- D 30 Hz

A-004-001-007 (B)

The ripple frequency produced by a half-wave power supply connected to a normal household circuit is:

- A 30 Hz
- B 60 Hz
- C 90 Hz
- D 120 Hz

A-004-001-008 (C)

Full-wave voltage doublers:

- A use less power than half-wave doublers
- B are used only in high-frequency power supplies
- C use both halves of an AC wave
- D create four times the output voltage of half-wave doublers

A-004-001-009 (A)

What are the two major ratings that must not be exceeded for silicon-diode rectifiers used in power-supply circuits?

- A Peak inverse voltage; average forward current
- B Average power; average voltage
- C Capacitive reactance; avalanche voltage
- D Peak load impedance; peak voltage

A-004-001-010 (C)

In a high voltage power supply, why should a resistor and capacitor be wired in parallel with the power-supply rectifier diodes?

- A To decrease the output voltage
- B To ensure that the current through each diode is about the same
- C To equalize voltage drops and guard against transient voltage spikes
- D To smooth the output waveform

A-004-001-011 (A)

What is the output waveform of an unfiltered full-wave rectifier connected to a resistive load?

- A A series of pulses at twice the frequency of the AC input
- B A steady DC voltage
- C A sine wave at half the frequency of the AC input
- D A series of pulses at the same frequency as the AC input

A-004-002-001 (A)

Filter chokes are rated according to:

- A inductance and current-handling capacity
- B reactance at 1000 Hz
- C power loss
- D breakdown voltage

A-004-002-002 (D)

Which of the following circuits gives the best regulation, under similar load conditions?

- A A half-wave bridge rectifier with a capacitor input filter
- B A half-wave rectifier with a choke input filter
- C A full-wave rectifier with a capacitor input filter
- D A full-wave rectifier with a choke input filter

A-004-002-003 (C)

The advantage of the capacitor input filter over the choke input filter is:

- A improved voltage regulation
- B lower peak rectifier currents
- C a higher terminal voltage output
- D better filtering action or smaller ripple voltage

A-004-002-004 (B)

With a normal load, the choke input filter will give the:

- A highest output voltage
- B best regulated output
- C greatest percentage of ripple
- D greatest ripple frequency

A-004-002-005 (D)

There are two types of filters in general use in a power supply. They are called:

- A choke output and capacitor output
- B choke input and capacitor output
- C choke output and capacitor input
- D choke input and capacitor input

A-004-002-006 (D)

The main function of the bleeder resistor in a power supply is to provide a discharge path for the capacitor in the power supply. But it may also be used for a secondary function, which is to:

- A provide a ground return for the transformer
- B inhibit the flow of current through the supply
- C act as a secondary smoothing device in conjunction with the filter
- D improve voltage regulation

A-004-002-007 (D)

In a power supply, series chokes will:

- A readily pass the DC and the AC component
- B impede the passage of DC but will pass the AC component
- C impede both DC and AC
- D readily pass the DC but will impede the flow of the AC component

A-004-002-008 (A)

When using a choke input filter, a minimum current should be drawn all the time when the device is switched on. This can be accomplished by:

- A including a suitable bleeder resistance
- B utilizing a full-wave bridge rectifier circuit
- C placing an ammeter in the output circuit
- D increasing the value of the output capacitor

A-004-002-009 (A)

In the design of a power supply, the designer must be careful of resonance effects because the ripple voltage could build up to a high value. The components that must be carefully selected are:

- A first choke and first capacitor
- B the bleeder resistor and the first choke
- C first capacitor and second capacitor
- D first choke and second capacitor

A-004-002-010 (A)

Excessive rectifier peak current and abnormally high peak inverse voltages can be caused in a power supply by the filter forming a:

- A series resonant circuit with the first choke and first capacitor
- B short circuit across the bleeder
- C parallel resonant circuit with the first choke and second capacitor
- D tuned inductance in the filter choke

A-004-002-011 (D)

In a properly designed choke input filter power supply, the no-load voltage across the filter capacitor will be about nine-tenths of the AC RMS voltage; yet it is advisable to use capacitors rated at the peak transformer voltage. Why is this large safety margin suggested?

- A Resonance can be set up in the filter producing high voltages
- B Under heavy load, high currents and voltages are produced
- C Under no-load conditions, the current could reach a high level
- D Under no-load conditions and a burned-out bleeder, voltages could reach the peak transformer voltage

A-004-003-001 (A)

What is one characteristic of a linear electronic voltage regulator?

- A The conduction of a control element is varied in direct proportion to the line voltage or load current
- B It has a ramp voltage at its output
- C A pass transistor switches from its "on" state to its "off" state
- D The control device is switched on or off, with the duty cycle proportional to the line or load conditions

A-004-003-002 (A)

What is one characteristic of a switching voltage regulator?

- A The control device is switched on and off, with the duty cycle proportional to the line or load conditions
- B The conduction of a control element is varied in direct proportion to the line voltage or load current
- C It provides more than one output voltage
- D It gives a ramp voltage at its output

A-004-003-003 (C)

What device is typically used as a stable reference voltage in a linear voltage regulator?

- A A varactor diode
- B A junction diode
- C A Zener diode
- D An SCR

A-004-003-004 (A)

What type of linear regulator is used in applications requiring efficient utilization of the primary power source?

- A A series regulator
- B A shunt regulator
- C A constant current source
- D A shunt current source

A-004-003-005 (C)

What type of linear voltage regulator is used in applications requiring a constant load on the unregulated voltage source?

- A A shunt current source
- B A series regulator
- C A shunt regulator
- D A constant current source

A-004-003-006 (D)

How is remote sensing accomplished in a linear voltage regulator?

- A An error amplifier compares the input voltage to the reference voltage
- B A load connection is made outside the feedback loop
- C By wireless inductive loops
- D A feedback connection to an error amplifier is made directly to the load

A-004-003-007 (B)

What is a three-terminal regulator?

- A A regulator that supplies three voltages with variable current
- B A regulator containing a voltage reference, error amplifier, sensing resistors and transistors, and a pass element
- C A regulator that supplies three voltages at a constant current
- D A regulator containing three error amplifiers and sensing transistors

A-004-003-008 (D)

In addition to an input voltage range what are the important characteristics of a three-terminal regulator?

- A Maximum output voltage and minimum output current
- B Minimum output voltage and maximum output current
- C Output voltage and minimum output current
- D Output voltage and maximum output current

A-004-003-009 (D)

What type of voltage regulator contains a voltage reference, error amplifier, sensing resistors and transistors, and a pass element in one package?

- A An op-amp regulator
- B A switching regulator
- C A Zener regulator
- D A three-terminal regulator

A-004-003-010 (D)

When extremely low ripple is required, or when the voltage supplied to the load must remain constant under conditions of large fluctuations of current and line voltage, a closed-loop amplifier is used to regulate the power supply. There are two main categories of electronic regulators. They are:

- A non-linear and switching
- B linear and non-linear
- C stiff and switching
- D linear and switching

A-004-003-011 (A)

A modern type of regulator, which features a reference, high-gain amplifier, temperature-compensated voltage sensing resistors and transistors as well as a pass element is commonly referred to as a:

- A three-terminal regulator
- B nine-pin terminal regulator
- C twenty-four pin terminal
- D regulator six-terminal regulator

A-004-004-001 (A)

In a series-regulated power supply, the power dissipation of the pass transistor is:

- A directly proportional to the load current and the input/output voltage differential
- B the inverse of the load current and the input/output voltage differential
- C dependent upon the peak inverse voltage appearing across the Zener diode
- D indirectly proportional to the load voltage and the input/output voltage differential

A-004-004-002 (D)

In any regulated power supply, the output is cleanest and the regulation is best:

- A across the secondary of the pass transistor
- B across the load
- C at the output of the pass transistor
- D at the point where the sampling network or error amplifier is connected

A-004-004-003 (D)

When discussing a power supply the \_\_\_\_\_ resistance is equal to the output voltage divided by the total current drawn, including the current drawn by the bleeder resistor:

- A ideal
- B rectifier
- C differential
- D load

A-004-004-004 (B)

The regulation of long-term changes in the load resistance of a power supply is called:

- A dynamic regulation
- B static regulation
- C active regulation
- D analog regulation

A-004-004-005 (C)

The regulation of short-term changes in the load resistance of a power supply is called:

- A analog regulation
- B active regulation
- C dynamic regulation
- D static regulation

A-004-004-006 (A)

The dynamic regulation of a power supply is improved by increasing the value of:

- A the output capacitor
- B the choke
- C the input capacitor
- D the bleeder resistor

A-004-004-007 (C)

The output capacitor, in a power supply filter used to provide power for an SSB or CW transmitter, will give better dynamic regulation if:

- A a battery is placed in series with the output capacitor
- B it is placed in series with other capacitors
- C the output capacitance is increased
- D the negative terminal of the electrolytic capacitor is connected to the positive and the positive terminal to ground

A-004-004-008 (C)

In a regulated power supply, four diodes connected together in a BRIDGE act as:

- A matching between the secondary of the power transformer and the filter
- B a tuning network
- C a rectifier
- D equalization across the transformer

A-004-004-009 (B)

In a regulated power supply, components that conduct alternating current at the input before the transformer and direct current before the output are:

- A chokes
- B fuses
- C capacitors
- D diodes

A-004-004-010 (A)

In a regulated power supply, the output of the electrolytic filter capacitor is connected to the:

- A voltage regulator
- B pi filter
- C solid-state by-pass circuit
- D matching circuit for the load

A-004-004-011 (A)

In a regulated power supply, a diode connected across the input and output terminals of a regulator is used to:

- A protect the regulator from reverse voltages
- B provide an RF by-pass for the voltage control
- C provide additional capacity
- D protect the regulator from voltage fluctuations in the primary of the transformer

A-005-001-001 (B)

How is the positive feedback coupled to the input in a Hartley oscillator?

- A Through a neutralizing capacitor
- B Through a tapped coil
- C Through a capacitive divider
- D Through link coupling

A-005-001-002 (A)

How is positive feedback coupled to the input in a Colpitts oscillator?

- A Through a capacitive divider
- B Through a tapped coil
- C Through a neutralizing capacitor
- D Through a link coupling

A-005-001-003 (C)

How is positive feedback coupled to the input in a Pierce oscillator?

- A Through link coupling
- B Through a tapped coil
- C Through capacitive coupling
- D Through a neutralizing capacitor

A-005-001-004 (C)

Why is the Colpitts oscillator circuit commonly used in a VFO?

- A The frequency is a linear function with load impedance
- B It has high output power
- C It is stable
- D It can be used with or without crystal lock-in

A-005-001-005 (C)

Why must a very stable reference oscillator be used as part of a phase-locked loop (PLL) frequency synthesizer?

- A Any amplitude variations in the reference oscillator signal will prevent the loop from changing frequency
- B Any amplitude variations in the reference oscillator signal will prevent the loop from locking to the desired signal
- C Any phase variations in the reference oscillator signal will produce phase noise in the synthesizer output
- D Any phase variations in the reference oscillator signal will produce harmonic distortion in the modulating signal

A-005-001-006 (B)

Positive feedback from a capacitive divider indicates the oscillator type is:

- A Miller
- B Colpitts
- C Pierce
- D Hartley

A-005-001-007 (A)

In an RF oscillator circuit designed for high stability, the positive feedback is drawn from two capacitors connected in series. These two capacitors would most likely be:

- A silver mica
- B ceramic
- C electrolytics
- D Mylar

A-005-001-008 (D)

In an oscillator circuit where positive feedback is obtained through a single capacitor in series with the crystal, the type of oscillator is:

- A Colpitts
- B Hartley
- C Miller
- D Pierce

A-005-001-009 (B)

A circuit depending on positive feedback for its operation would be a:

- A audio amplifier
- B variable-frequency oscillator
- C mixer
- D detector

A-005-001-010 (C)

An apparatus with an oscillator and a class C amplifier would be:

- A a two-stage frequency-modulated transmitter
- B a two-stage regenerative receiver
- C a two-stage CW transmitter
- D a fixed-frequency single-sideband transmitter

A-005-001-011 (C)

In an oscillator where positive feedback is provided through a capacitor in series with a crystal, that type of oscillator is a:

- A Hartley
- B Franklin
- C Pierce
- D Colpitts

A-005-002-001 (D)

The output tuning controls on a transmitter power amplifier with an adjustable PI network:

- A allow switching to different antennas
- B reduce the possibility of cross-modulation in adjunct receivers
- C are involved with frequency multiplication in the previous stage
- D allow efficient transfer of power to the antenna

A-005-002-002 (B)

The purpose of using a centre-tap return connection on the secondary of transmitting tube's filament transformer is to:

- A obtain optimum power output
- B prevent modulation of the emitted wave by the alternating current filament supply
- C reduce the possibility of harmonic emissions
- D keep the output voltage constant with a varying load

A-005-002-003 (B)

In a grounded grid amplifier using a triode vacuum tube, the input signal is applied to:

- A the filament leads
- B the cathode
- C the plate
- D the control grid

A-005-002-004 (A)

In a grounded grid amplifier using a triode vacuum tube, the plate is connected to the pi-network through a:

- A blocking capacitor
- B by-pass capacitor
- C tuning capacitor
- D electrolytic capacitor

A-005-002-005 (B)

In a grounded grid amplifier using a triode vacuum tube, the plate is connected to a radio frequency choke. The other end of the radio frequency choke connects to the:

- A B- (bias)
- B B+ (high voltage)
- C filament voltage
- D ground

A-005-002-006 (C)

In a grounded grid amplifier using a triode vacuum tube, the cathode is connected to a radio frequency choke. The other end of the radio frequency choke connects to the:

- A filament voltage
- B B+ (high voltage)
- C B- (bias)
- D ground

A-005-002-007 (A)

In a grounded grid amplifier using a triode vacuum tube, the secondary winding of a transformer is connected directly to the vacuum tube. This transformer provides:

- A filament voltage
- B B- (bias)
- C B+ (high voltage)
- D Screen voltage

A-005-002-008 (C)

In a grounded grid amplifier using a triode vacuum tube, what would be the approximate B+ voltage required for an output of 400 watts at 400 mA with approximately 50 percent efficiency?

- A 3000 volts
- B 1000 volts
- C 2000 volts
- D 500 volts

A-005-002-009 (B)

In a grounded grid amplifier using a triode vacuum tube, each side of the filament is connected to a capacitor whose other end is connected to ground. These are:

- A blocking capacitors
- B by-pass capacitors
- C tuning capacitors
- D electrolytic capacitors

A-005-002-010 (B)

After you have opened a VHF power amplifier to make internal tuning adjustments, what should you do before you turn the amplifier on?

- A Remove all amplifier shielding to ensure maximum cooling
- B Be certain all amplifier shielding is fastened in place
- C Make sure that the power interlock switch is bypassed so you can test the amplifier
- D Be certain no antenna is attached so that you will not cause any interference

A-005-002-011 (C)

Harmonics produced in an early stage of a transmitter may be reduced in a later stage by:

- A greater input to the final stage
- B transistors instead of tubes
- C tuned circuit coupling between stages
- D larger value coupling capacitors

A-005-003-001 (C)

In a simple 2 stage CW transmitter circuit, the oscillator stage and the class C amplifier stage are inductively coupled by a RF transformer. Another role of the RF transformer is to:

- A provide the necessary feedback for oscillation
- B act as part of a balanced mixer
- C be part of a tuned circuit
- D act as part of a pi filter

A-005-003-002 (B)

In a simple 2 stage CW transmitter, current to the collector of the transistor in the class C amplifier stage flows through a radio frequency choke (RFC) and a tapped inductor. The RFC, on the tapped inductor side, is also connected to grounded capacitors. The purpose of the RFC and capacitors is to:

- A form a RF-tuned circuit
- B form a low-pass filter
- C provide negative feedback
- D form a key-click filter

A-005-003-003 (C)

In a simple 2 stage CW transmitter, the transistor in the second stage would act as:

- A the master oscillator
- B an audio oscillator
- C a power amplifier
- D a frequency multiplier

A-005-003-004 (C)

An advantage of keying the buffer stage in a transmitter is that:

- A the radiated bandwidth is restricted
- B high RF voltages are not present
- C changes in oscillator frequency are less likely
- D key clicks are eliminated

A-005-003-005 (A)

As a power amplifier is tuned, what reading on its grid current meter indicates the best neutralization?

- A A minimum change in grid current as the output circuit is changed
- B Minimum grid current
- C Maximum grid current
- D A maximum change in grid current as the output circuit is changed

A-005-003-006 (B)

What does a neutralizing circuit do in an RF amplifier?

- A It controls differential gain
- B It cancels the effects of positive feedback
- C It eliminates AC hum from the power supply
- D It reduces incidental grid modulation

A-005-003-007 (B)

What is the reason for neutralizing the final amplifier stage of a transmitter?

- A To keep the carrier on frequency
- B To eliminate parasitic oscillations
- C To limit the modulation index
- D To cut off the final amplifier during standby periods

A-005-003-008 (D)

Parasitic oscillations are usually generated due to:

- A harmonics from some earlier multiplier stage
- B excessive drive or excitation to the power amplifier
- C a mismatch between power amplifier and transmission line
- D accidental resonant frequencies in the power amplifier

A-005-003-009 (B)

Parasitic oscillations would tend to occur mostly in:

- A mixer stages
- B RF power output stages
- C high gain audio output stages
- D high voltage rectifiers

A-005-003-010 (A)

Why is neutralization necessary for some vacuum-tube amplifiers?

- A To cancel oscillation caused by the effects of interelectrode capacitance
- B To reduce grid-to-cathode leakage
- C To cancel AC hum from the filament transformer
- D To reduce the limits of loaded Q

A-005-003-011 (D)

Parasitic oscillations in an RF power amplifier may be caused by:

- A overdriven stages
- B poor voltage regulation
- C excessive harmonic production
- D lack of neutralization

A-005-004-001 (A)

What type of signal does a balanced modulator produce?

- A Double sideband, suppressed carrier
- B FM with balanced deviation
- C Full carrier
- D Single sideband, suppressed carrier

A-005-004-002 (D)

How can a single-sideband phone signal be produced?

- A By driving a product detector with a DSB signal
- B By using a loop modulator followed by a mixer
- C By using a reactance modulator followed by a mixer
- D By using a balanced modulator followed by a filter

A-005-004-003 (A)

Carrier suppression in a single-sideband transmitter takes place in:

- A the balanced modulator stage
- B the carrier decouple stage
- C the mechanical filter
- D the frequency multiplier stage

A-005-004-004 (D)

Transmission with SSB, as compared to conventional AM transmission, results in:

- A 6 dB gain in the receiver
- B a greater bandpass requirement in the receiver
- C 3 dB gain in the transmitter
- D 6 dB gain in the transmitter and 3 dB gain in the receiver

A-005-004-005 (D)

The peak power output of a single-sideband transmitter, when being tested by a two-tone generator is:

- A equal to the RF peak output power of any of the tones
- B one-half of the RF peak output power of any of the tones
- C one-quarter of the RF peak output power of any of the tones
- D twice the RF power output of any of the tones

A-005-004-006 (C)

What kind of input signal is used to test the amplitude linearity of a single-sideband phone transmitter while viewing the output on an oscilloscope?

- A An audio-frequency square wave
- B Normal speech
- C Two audio-frequency sine waves
- D An audio-frequency sine wave

A-005-004-007 (B)

When testing the amplitude linearity of a single-sideband transmitter what audio tones are fed into the microphone input and on what kind of instrument is the output observed?

- A Two non-harmonically related tones are fed in, and the output is observed on a distortion analyzer
- B Two non-harmonically related tones are fed in, and the output is observed on an oscilloscope
- C Two harmonically related tones are fed in, and the output is observed on an oscilloscope
- D Two harmonically related tones are fed in, and the output is observed on a distortion analyzer

A-005-004-008 (C)

What audio frequencies are used in a two-tone test of the linearity of a single-sideband phone transmitter?

- A 1200 Hz and 2400 Hz tones must be used
- B Any two audio tones may be used, but they must be within the transmitter audio passband, and must be harmonically related
- C Any two audio tones may be used, but they must be within the transmitter audio passband, and should not be harmonically related
- D 20 Hz and 20 kHz tones must be used

A-005-004-009 (B)

What measurement can be made of a single-sideband phone transmitter's amplifier by performing a two-tone test using an oscilloscope?

- A Its percent of frequency modulation
- B Its linearity
- C Its frequency deviation
- D Its percent of carrier phase shift

A-005-004-010 (A)

How much is the carrier suppressed below peak output power in a single-sideband phone transmission?

- A At least 40 dB
- B No more than 20 dB
- C No more than 30 dB
- D At least 60 dB

A-005-004-011 (A)

What is meant by "flat topping" in a single-sideband phone transmission?

- A Signal distortion caused by excessive drive
- B Signal distortion caused by insufficient collector current
- C The transmitter's automatic level control is properly adjusted
- D The transmitter's carrier is properly suppressed

A-005-005-001 (D)

In an FM phone signal having a maximum frequency deviation of 3000 Hz either side of the carrier frequency, what is the modulation index, when the modulating frequency is 1000 Hz?

- A 0.3
- B 3000
- C 1000
- D 3

A-005-005-002 (D)

What is the modulation index of an FM phone transmitter producing an instantaneous carrier deviation of 6 kHz when modulated with a 2 kHz modulating frequency?

- A 0.333
- B 2000
- C 6000
- D 3

A-005-005-003 (D)

What is the deviation ratio of an FM phone transmitter having a maximum frequency swing of plus or minus 5 kHz and accepting a maximum modulation rate of 3 kHz?

- A 60
- B 0.16
- C 0.6
- D 1.66

A-005-005-004 (D)

What is the deviation ratio of an FM phone transmitter having a maximum frequency swing of plus or minus 7.5 kHz and accepting a maximum modulation rate of 3.5 kHz?

- A 0.47
- B 47
- C 0.214
- D 2.14

A-005-005-005 (C)

When the transmitter is not modulated, or the amplitude of the modulating signal is zero, the frequency of the carrier is called its:

- A frequency shift
- B modulating frequency
- C centre frequency
- D frequency deviation

A-005-005-006 (D)

In an FM transmitter system, the amount of deviation from the centre frequency is determined solely by the:

- A frequency of the modulating frequency
- B amplitude and the frequency of the modulating frequency
- C modulating frequency and the amplitude of the centre frequency
- D amplitude of the modulating frequency

A-005-005-007 (B)

Any FM wave with single-tone modulation has:

- A one sideband frequency
- B an infinite number of sideband frequencies
- C two sideband frequencies
- D four sideband frequencies

A-005-005-008 (D)

Some types of deviation meters work on the principle of:

- A detecting the frequencies in the sidebands
- B the amplitude of power in the sidebands
- C a carrier peak and dividing by the modulation index
- D a carrier null and multiplying the modulation frequency by the modulation index

A-005-005-009 (B)

When using some deviation meters, it is important to know:

- A pass-band of the IF filter
- B modulating frequency and the modulation index
- C modulation index
- D modulating frequency

A-005-005-010 (C)

What is the significant bandwidth of an FM-phone transmission having a +/- 5-kHz deviation and a 3-kHz modulating frequency?

- A 5 kHz
- B 3 kHz
- C 16 kHz
- D 8 kHz

A-005-005-011 (C)

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

- A +/- 5 kHz
- B +/- 41.67 Hz
- C +/- 416.7 Hz
- D +/- 12 kHz

A-005-006-001 (C)

If the signals of two repeater transmitters mix together in one or both of their final amplifiers and unwanted signals at the sum and difference frequencies of the original signals are generated and radiated, what is this called?

- A Adjacent channel interference
- B Amplifier desensitization
- C Intermodulation interference
- D Neutralization

A-005-006-002 (B)

How does intermodulation interference between two repeater transmitters usually occur?

- A When the signals are reflected out of phase by aircraft passing overhead
- B When they are in close proximity and the signals mix in one or both of their final amplifiers
- C When the signals are reflected in phase by aircraft passing overhead
- D When they are in close proximity and the signals cause feedback in one or both of their final amplifiers

A-005-006-003 (D)

How can intermodulation interference between two repeater transmitters in close proximity often be reduced or eliminated?

- A By installing a low-pass filter in the antenna transmission line
- B By installing a high-pass filter in the antenna transmission line
- C By using a Class C final amplifier with high driving power
- D By installing a terminated circulator or ferrite isolator in the transmission line to the transmitter and duplexer

A-005-006-004 (D)

If a receiver tuned to 146.70 MHz receives an intermodulation product signal whenever a nearby transmitter transmits on 146.52, what are the two most likely frequencies for the other interfering signal?

- A 146.88 MHz and 146.34 MHz
- B 146.01 MHz and 147.30 MHz
- C 73.35 MHz and 239.40 MHz
- D 146.34 MHz and 146.61 MHz

A-005-006-005 (B)

What type of circuit varies the tuning of an amplifier tank circuit to produce FM signals?

- A An audio modulator
- B A phase modulator
- C A balanced modulator
- D A double balanced mixer

A-005-006-006 (B)

What audio shaping network is added at an FM transmitter to attenuate the lower audio frequencies?

- A A de-emphasis network
- B A pre-emphasis network
- C An audio prescaler
- D A heterodyne suppressor

A-005-006-007 (C)

Which type of filter would be best to use in a 2-metre repeater duplexer?

- A An L-C filter
- B A crystal filter
- C A cavity filter
- D A DSP filter

A-005-006-008 (A)

The characteristic difference between a phase modulator and a frequency modulator is:

- A pre-emphasis
- B the centre frequency
- C de-emphasis
- D frequency inversion

A-005-006-009 (B)

In most modern FM transmitters, to produce a better sound, a compressor and a clipper are placed:

- A in the microphone circuit, before the audio amplifier
- B between the audio amplifier and the modulator
- C between the multiplier and the PA
- D between the modulator and the oscillator

A-005-006-010 (B)

Three important parameters to be verified in an FM transmitter are:

- A frequency stability, de-emphasis and linearity
- B power, frequency deviation and frequency stability
- C distortion, bandwidth and sideband power
- D modulation, pre-emphasis and carrier suppression

A-005-006-011 (C)

Intermodulation interference products are not typically associated with which of the following:

- A receiver frontend
- B passive intermodulation
- C intermediate frequency stage
- D final amplifier stage

A-005-007-001 (A)

Maintaining the peak RF output of a SSB transmitter at a relatively constant level requires a circuit called the:

- A automatic level control (ALC)
- B automatic gain control (AGC)
- C automatic output control (AOC)
- D automatic volume control (AVC)

A-005-007-002 (B)

Speech compression associated with SSB transmission implies:

- A circuit level instability
- B full amplification of low level signals and reducing or eliminating amplification of high level signals
- C full amplification of high level signals and reducing or eliminating signals amplification of low level
- D a lower signal-to-noise ratio

A-005-007-003 (B)

Which of the following functions is not included in a typical digital signal processor?

- A Mathematical transform
- B Aliasing amplifier
- C Analog to digital converter
- D Digital to analog converter

A-005-007-004 (C)

How many bits are required to provide 256 discrete levels, or a ratio of 256:1?

- A 16 bits
- B 4 bits
- C 8 bits
- D 6 bits

A-005-007-005 (C)

Adding one bit to the word length, is equivalent to adding \_\_\_\_ dB to the dynamic range of the digitizer:

- A 4 dB
- B 3 dB
- C 6 dB
- D 1 dB

A-005-007-006 (B)

What do you call the circuit which employs an analog to digital converter, a mathematical transform, a digital to analog converter and a low pass filter?

- A Digital transformer
- B Digital signal processor
- C Digital formatter
- D Mathematical transformer

A-005-007-007 (B)

Which principle is not associated with analog signal processing?

- A Clipping
- B Frequency division
- C Compression
- D Bandwidth limiting

A-005-007-008 (B)

Which of the following is not a method used for peak limiting, in a signal processor?

- A AF clipping
- B Frequency clipping
- C RF clipping
- D Compression

A-005-007-009 (D)

What is the undesirable result of AF clipping in a speech processor?

- A Reduced average power
- B Increased average power
- C Reduction in peak amplitude
- D Increased harmonic distortion

A-005-007-010 (A)

Which description is not correct? You are planning to build a speech processor for your transceiver. Compared to AF clipping, RF clipping:

- A is easier to implement
- B has less distortion
- C is more expensive to implement
- D is more difficult to implement

A-005-007-011 (D)

Automatic Level Control (ALC) is another name for:

- A AF compression
- B RF clipping
- C AF clipping
- D RF compression

A-005-008-001 (A)

What digital code consists of elements having unequal length?

- A Varicode
- B AX.25
- C Baudot
- D ASCII

A-005-008-002 (C)

Open Systems Interconnection (OSI) model standardizes communications functions as layers within a data communications system. Amateur digital radio systems often follow the OSI model in structure. What is the base layer of the OSI model involving the interconnection of a packet radio TNC to a computer terminal?

- A The network layer
- B The transport layer
- C The physical layer
- D The link layer

A-005-008-003 (A)

What is the purpose of a Cyclic Redundancy Check (CRC)?

- A Error detection
- B Lossy compression
- C Error correction
- D Lossless compression

A-005-008-004 (B)

What is one advantage of using ASCII rather than Baudot code?

- A The larger character set allows store-and-forward
- B It includes both upper and lower case text characters in the code
- C ASCII includes built-in error correction
- D ASCII characters contain fewer information bits

A-005-008-005 (C)

What type of error control system is used in AMTOR ARQ (Mode A)?

- A Each character is sent twice
- B Mode A AMTOR does not include an error control system
- C The receiving station automatically requests repeats when needed
- D The receiving station checks the frame check sequence (FCS) against the transmitted FCS

A-005-008-006 (A)

What error-correction system is used in AMTOR FEC (Mode B)?

- A Each character is sent twice
- B Mode B AMTOR does not include an error-correction system
- C The receiving station automatically requests repeats when needed
- D The receiving station checks the frame check sequence (FCS) against the transmitted FCS

A-005-008-007 (B)

APRS (Automatic Packet Reporting System) does NOT support which one of these functions?

- A Amateur-specific local information broadcast
- B Automatic link establishment
- C Two-way messaging
- D Telemetry

A-005-008-008 (A)

Which algorithm may be used to create a Cyclic Redundancy Check (CRC)?

- A Hash function
- B Dynamic Huffman code
- C Convolution code
- D Lempel-Ziv routine

A-005-008-009 (C)

The designator AX.25 is associated with which amateur radio mode?

- A ASCII
- B spread spectrum speech
- C packet
- D RTTY

A-005-008-010 **(D)**

How many information bits are included in the Baudot code?

- A 7
- B 8
- C 6
- D 5

A-005-008-011 **(B)**

How many information bits are included in the ISO-8859 extension to the ASCII code?

- A 5
- B 8
- C 7
- D 6

A-005-009-001 **(C)**

What term describes a wide-band communications system in which the RF carrier varies according to some predetermined sequence?

- A AMTOR
- B Time domain frequency modulation
- C Spread spectrum communication
- D Amplitude-companded single sideband

A-005-009-002 **(C)**

What is the term used to describe a spread spectrum communications system where the centre frequency of a conventional carrier is changed many times per second in accordance with a pseudorandom list of channels?

- A Time-domain frequency modulation
- B Frequency companded spread spectrum
- C Frequency hopping
- D Direct sequence

A-005-009-003 **(C)**

What term is used to describe a spread spectrum communications system in which a very fast binary bit stream is used to shift the phase of an RF carrier?

- A Phase companded spread spectrum
- B Binary phase-shift keying
- C Direct sequence
- D Frequency hopping

A-005-009-004 **(D)**

Frequency hopping is used with which type of transmission?

- A AMTOR
- B Packet
- C RTTY
- D Spread spectrum

A-005-009-005 **(D)**

Direct sequence is used with which type of transmission?

- A AMTOR
- B Packet
- C RTTY
- D Spread spectrum

A-005-009-006 **(D)**

Which type of signal is used to produce a predetermined alteration in the carrier for spread spectrum communication?

- A Frequency-companded sequence
- B Quantizing noise
- C Random noise sequence
- D Pseudo-random sequence

A-005-009-007 **(A)**

Why is it difficult to monitor a spread spectrum transmission?

- A Your receiver must be frequency-synchronized to the transmitter
- B It requires narrower bandwidth than most receivers have
- C It varies too quickly in amplitude
- D The signal is too distorted for comfortable listening

A-005-009-008 **(B)**

What is frequency hopping spread spectrum?

- A The carrier is phase-shifted by a fast binary bit stream
- B The carrier frequency is changed in accordance with a pseudo-random list of channels
- C The carrier is amplitude-modulated over a wide range called the spread
- D The carrier is frequency-companded

A-005-009-009 (B)

What is direct-sequence spread spectrum?

- A The carrier is altered in accordance with a pseudo-random list of channels
- B The carrier is phase-shifted by a fast binary bit stream
- C The carrier is amplitude modulated over a range called the spread
- D The carrier is frequency-companded

A-005-009-010 (A)

Why are received spread-spectrum signals so resistant to interference?

- A Signals not using the spectrum-spreading algorithm are suppressed in the receiver
- B The receiver is always equipped with a special digital signal processor (DSP) interference filter
- C If interference is detected by the receiver, it will signal the transmitter to change frequencies
- D The high power used by a spread-spectrum transmitter keeps its signal from being easily overpowered

A-005-009-011 (A)

How does the spread-spectrum technique of frequency hopping work?

- A The frequency of an RF carrier is changed very rapidly according to a particular pseudo-random sequence
- B If interference is detected by the receiver, it will signal the transmitter to change frequency
- C If interference is detected by the receiver, it will signal the transmitter to wait until the frequency is clear
- D A pseudo-random bit stream is used to shift the phase of an RF carrier very rapidly in a particular sequence

A-006-001-001 (A)

What are the advantages of the frequency conversion process in a superheterodyne receiver?

- A Increased selectivity and optimal tuned circuit design
- B Automatic detection in the RF amplifier and increased sensitivity
- C Automatic soft-limiting and automatic squelching
- D Automatic squelching and increased sensitivity

A-006-001-002 (A)

What factors should be considered when selecting an intermediate frequency?

- A Image rejection and responses to unwanted signals
- B Noise figure and distortion
- C Interference to other services
- D Cross-modulation distortion and interference

A-006-001-003 (D)

One of the greatest advantages of the double-conversion over the single-conversion receiver is that it:

- A is much more stable
- B is much more sensitive
- C produces a louder signal at the output
- D greater reduction of image interference for a given front end selectivity

A-006-001-004 (C)

In a communications receiver, a crystal filter would be located in the:

- A audio output stage
- B detector
- C IF circuits
- D local oscillator

A-006-001-005 (A)

A multiple conversion superheterodyne receiver is more susceptible to spurious responses than a single-conversion receiver because of the:

- A additional oscillators and mixing frequencies involved in the design
- B poorer selectivity in the IF caused by the multitude of frequency changes
- C greater sensitivity introducing higher levels of RF to the receiver
- D AGC being forced to work harder causing the stages concerned to overload

A-006-001-006 (D)

In a dual-conversion superheterodyne receiver what are the respective aims of the first and second conversion:

- A selectivity and image rejection
- B selectivity and dynamic range
- C image rejection and noise figure
- D image rejection and selectivity

A-006-001-007 (C)

Which stage of a receiver has its input and output circuits tuned to the received frequency?

- A The audio frequency amplifier
- B The detector
- C The RF amplifier
- D The local oscillator

A-006-001-008 (A)

Which stage of a superheterodyne receiver lies between a tuneable stage and a fixed tuned stage?

- A Mixer
- B Radio frequency amplifier
- C Intermediate frequency amplifier
- D Local oscillator

A-006-001-009 (A)

A single conversion receiver with a 9 MHz IF has a local oscillator operating at 16 MHz. The frequency it is tuned to is:

- A 7 MHz
- B 16 MHz
- C 21 MHz
- D 9 MHz

A-006-001-010 (A)

A double conversion receiver designed for SSB reception has a beat frequency oscillator and:

- A two IF stages and two local oscillators
- B one IF stage and one local oscillator
- C two IF stages and three local oscillators
- D two IF stages and one local oscillator

A-006-001-011 (D)

The advantage of a double conversion receiver over a single conversion receiver is that it:

- A does not drift off frequency
- B is a more sensitive receiver
- C produces a louder audio signal
- D suffers less from image interference for a given front end sensitivity

A-006-002-001 (A)

The mixer stage of a superheterodyne receiver is used to:

- A change the frequency of the incoming signal to that of the IF
- B allow a number of IF frequencies to be used
- C remove image signals from the receiver
- D produce an audio frequency for the speaker

A-006-002-002 (D)

A superheterodyne receiver designed for SSB reception must have a beat-frequency oscillator (BFO) because:

- A it phases out the unwanted sideband signal
- B it reduces the pass-band of the IF stages
- C it beats with the receiver carrier to produce the missing sideband
- D the suppressed carrier must be replaced for detection

A-006-002-003 (B)

The first mixer in the receiver mixes the incoming signal with the local oscillator to produce:

- A a high frequency oscillator (HFO) frequency
- B an intermediate frequency
- C an audio frequency
- D a radio frequency

A-006-002-004 (C)

If the incoming signal to the mixer is 3 600 kHz and the first IF is 9 MHz, at which one of the following frequencies would the local oscillator (LO) operate?

- A 10 600 kHz
- B 21 600 kHz
- C 5 400 kHz
- D 3 400 kHz

A-006-002-005 (B)

The BFO is off-set slightly (500 - 1 500 Hz) from the incoming signal to the detector. This is required:

- A to protect the incoming signal from interference
- B to beat with the incoming signal
- C to pass the signal without interruption
- D to provide additional amplification

A-006-002-006 (D)

It is very important that the oscillators contained in a superheterodyne receiver are:

- A sensitive and selective
- B stable and sensitive
- C selective and spectrally pure
- D stable and spectrally pure

A-006-002-007 (C)

In a superheterodyne receiver, a stage before the IF amplifier has a variable capacitor in parallel with a trimmer capacitor and an inductance. The variable capacitor is for:

- A tuning of the beat-frequency oscillator (BFO)
- B tuning both the antenna and the LO
- C tuning of the local oscillator (LO)
- D tuning both the antenna and the BFO

A-006-002-008 (C)

In a superheterodyne receiver without an RF amplifier, the input to the mixer stage has a variable capacitor in parallel with an inductance. The variable capacitor is for:

- A tuning the beat-frequency oscillator
- B tuning both the antenna and the local oscillator
- C tuning the receiver preselector to the reception frequency
- D tuning both the antenna and the beat-frequency oscillator

A-006-002-009 (A)

What receiver stage combines a 14.25-MHz input signal with a 13.795-MHz oscillator signal to produce a 455-kHz intermediate frequency (IF) signal?

- A Mixer
- B BFO
- C VFO
- D Multiplier

A-006-002-010 (B)

Which two stages in a superheterodyne receiver have input tuned circuits tuned to the same frequency?

- A RF and local oscillator
- B RF and first mixer
- C IF and local oscillator
- D RF and IF

A-006-002-011 (C)

The mixer stage of a superheterodyne receiver:

- A acts as a buffer stage
- B demodulates SSB signals
- C produces an intermediate frequency
- D produces spurious signals

A-006-003-001 (D)

What is meant by the noise floor of a receiver?

- A The weakest signal that can be detected under noisy atmospheric conditions
- B The minimum level of noise that will overload the receiver RF amplifier stage
- C The amount of noise generated by the receiver local oscillator
- D The weakest signal that can be detected above the receiver internal noise

A-006-003-002 (D)

Which of the following is a purpose of the first IF amplifier stage in a receiver?

- A To tune out cross-modulation distortion
- B To increase dynamic response
- C To improve noise figure performance
- D To improve selectivity and gain

A-006-003-003 (C)

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

- A It depends on the amplification factor of the first IF stage
- B Sufficient gain to keep weak signals below the noise of the first mixer stage
- C Sufficient gain to allow weak signals to overcome noise generated in the first mixer stage
- D As much gain as possible, short of self-oscillation

A-006-003-004 (C)

What is the primary purpose of an RF amplifier in a receiver?

- A To develop the AGC voltage
- B To provide most of the receiver gain
- C To improve the receiver noise figure
- D To vary the receiver image rejection by using the AGC

A-006-003-005 (C)

How is receiver sensitivity often expressed for UHF FM receivers?

- A Noise Figure in decibels
- B Overall gain in decibels
- C RF level for 12 dB SINAD
- D RF level for a given Bit Error Rate (BER)

A-006-003-006 (B)

What is the term used for the decibel difference (or ratio) between the largest tolerable receiver input signal (without causing audible distortion products) and the minimum discernible signal (sensitivity)?

- A Noise figure
- B Dynamic range
- C Design parameter
- D Stability

A-006-003-007 (C)

The lower the receiver noise figure becomes, the greater will be the receiver's \_\_\_\_\_:

- A selectivity
- B stability
- C sensitivity
- D rejection of unwanted signals

A-006-003-008 (B)

The noise generated in a receiver of good design originates in the:

- A IF amplifier and detector
- B RF amplifier and mixer
- C detector and AF amplifier
- D BFO and detector

A-006-003-009 (A)

Why are very low noise figures relatively unimportant for a high frequency receiver?

- A External HF noise, man-made and natural, are higher than the internal noise generated by the receiver
- B Ionospheric distortion of the received signal creates high noise levels
- C The use of SSB and CW on the HF bands overcomes the noise
- D Regardless of the front end, the succeeding stages when used on HF are very noisy

A-006-003-010 (C)

The term which relates specifically to the amplitude levels of multiple signals that can be accommodated during reception is called:

- A cross-modulation index
- B noise figure
- C dynamic range
- D AGC

A-006-003-011 (D)

Normally, front-end selectivity is provided by the resonant networks both before and after the RF stage in a superheterodyne receiver. This whole section of the receiver is often referred to as the:

- A preamble
- B preamplifier
- C pass-selector
- D preselector

A-006-004-001 (B)

What audio shaping network is added at an FM receiver to restore proportionally attenuated lower audio frequencies?

- A A heterodyne suppressor
- B A de-emphasis network
- C A pre-emphasis network
- D An audio prescaler

A-006-004-002 (A)

What does a product detector do?

- A It mixes an incoming signal with a locally generated carrier
- B It provides local oscillations for input to a mixer
- C It amplifies and narrows band-pass frequencies
- D It detects cross-modulation products

A-006-004-003 (D)

Distortion in a receiver that only affects strong signals usually indicates a defect in or mis-adjustment of the:

- A IF amplifier
- B AF amplifier
- C RF amplifier
- D automatic gain control (AGC)

A-006-004-004 (C)

In a superheterodyne receiver with automatic gain control (AGC), as the strength of the signal increases, the AGC:

- A distorts the signal
- B introduces limiting
- C reduces the receiver gain
- D increases the receiver gain

A-006-004-005 (C)

The amplified IF signal is applied to the \_\_\_\_\_ stage in a superheterodyne receiver:

- A audio output
- B LO
- C detector
- D RF amplifier

A-006-004-006 (B)

The low-level output of a detector is:

- A applied to the RF amplifier
- B applied to the AF amplifier
- C grounded via the chassis
- D fed directly to the speaker

A-006-004-007 (A)

The overall output of an AM/CW/SSB receiver can be adjusted by means of manual controls on the receiver or by use of a circuit known as:

- A automatic gain control
- B automatic frequency control
- C inverse gain control
- D automatic load control

A-006-004-008 (A)

AGC voltage is applied to the:

- A RF and IF amplifiers
- B AF and IF amplifiers
- C RF and AF amplifiers
- D detector and AF amplifiers

A-006-004-009 (B)

AGC is derived in a receiver from one of two circuits. Depending on the method used, it is called:

- A detector derived or audio derived
- B IF derived or audio derived
- C RF derived or audio derived
- D IF derived or RF derived

A-006-004-010 (B)

Which two variables primarily determine the behaviour of an automatic gain control (AGC) loop?

- A Clipping level and hang time
- B Threshold and decay time
- C Blanking level and slope
- D Slope and bandwidth

A-006-004-011 (A)

What circuit combines signals from an IF amplifier stage and a beat-frequency oscillator (BFO), to produce an audio signal?

- A A product detector circuit
- B An AGC circuit
- C A power supply circuit
- D A VFO circuit

A-006-005-001 (A)

What part of a superheterodyne receiver determines the image rejection ratio of the receiver?

- A RF amplifier pre-selector
- B Product detector
- C AGC loop
- D IF filter

A-006-005-002 (B)

What is the term for the reduction in receiver sensitivity caused by a strong signal near the received frequency?

- A Quieting
- B Desensitization
- C Cross-modulation interference
- D Squelch gain rollback

A-006-005-003 (D)

What causes receiver desensitization?

- A Squelch gain adjusted too high
- B Squelch gain adjusted too low
- C Audio gain adjusted too low
- D Strong near frequency signals

A-006-005-004 (B)

What is one way receiver desensitization can be reduced?

- A Increase the transmitter audio gain
- B Use a cavity filter
- C Decrease the receiver squelch gain
- D Increase the receiver bandwidth

A-006-005-005 (C)

What causes intermodulation in an electronic circuit?

- A Positive feedback
- B Lack of neutralization
- C Nonlinear circuits or devices
- D Too little gain

A-006-005-006 (C)

Which of the following is an important reason for using a VHF intermediate frequency in an HF receiver?

- A To tune out cross-modulation distortion
- B To prevent the generation of spurious mixer products
- C To move the image response far away from the filter passband
- D To provide a greater tuning range

A-006-005-007 (D)

Intermodulation interference is produced by:

- A the interaction of products from high-powered transmitters in the area
- B the high-voltage stages in the final amplifier of an amplitude or frequency-modulated transmitter
- C the mixing of more than one signal in the first or second intermediate frequency amplifiers of a receiver
- D the mixing of two or more signals in the front-end of a superheterodyne receiver

A-006-005-008 (B)

Which of the following is NOT a direct cause of instability in a receiver?

- A Temperature variations
- B Dial display accuracy
- C Mechanical rigidity
- D Feedback components

A-006-005-009 (A)

Poor frequency stability in a receiver usually originates in the:

- A local oscillator and power supply
- B detector
- C RF amplifier
- D mixer

A-006-005-010 (C)

Poor dynamic range of a receiver can cause many problems when a strong signal appears within or near the front-end bandpass. Which of the following is NOT caused as a direct result?

- A Intermodulation
- B Cross-modulation
- C Feedback
- D Desensitization

A-006-005-011 (C)

Which of these measurements is a good indicator of VHF receiver performance in an environment of strong out-of-band signals?

- A Blocking Dynamic Range
- B Intermediate frequency rejection ratio
- C Two-tone Third-Order IMD Dynamic Range, 10 MHz spacing
- D Third-Order Intercept Point

A-007-001-001 (B)

For an antenna tuner of the "Transformer" type, which of the following statements is FALSE?

- A The circuit is known as a transformer-type antenna tuner
- B The circuit is known as a Pi-type antenna tuner
- C The input is suitable for 50 ohm impedance
- D The output is suitable for impedances from low to high

A-007-001-002 (D)

For an antenna tuner of the "Series" type, which of the following statements is false?

- A The circuit is known as a Series-type antenna tuner
- B The output is suitable for impedances from low to high
- C The input is suitable for impedance of 50 ohms
- D The circuit is known as a Pi-type antenna tuner

A-007-001-003 (C)

For an antenna tuner of the "L" type, which of the following statements is false?

- A The antenna output is high impedance
- B The circuit is known as an L-type antenna tuner
- C The circuit is suitable for matching to a vertical ground plane antenna
- D The transmitter input is suitable for 50 ohms impedance

A-007-001-004 (B)

For an antenna tuner of the "Pi" type, which of the following statements is false?

- A The circuit is a Pi-type antenna tuner
- B The circuit is a series-type antenna tuner
- C The transmitter input is suitable for impedance of 50 ohms
- D The antenna output is suitable for impedances from low to high

A-007-001-005 (A)

What is a pi-network?

- A A network consisting of one inductor and two capacitors or two inductors and one capacitor
- B An antenna matching network that is isolated from ground
- C A network consisting of four inductors or four capacitors
- D A power incidence network

A-007-001-006 (A)

Which type of network offers the greatest transformation ratio?

- A Pi-network
- B Chebyshev
- C Butterworth
- D L-network

A-007-001-007 (A)

Why is an L-network of limited utility in impedance matching?

- A It matches only a small impedance range
- B It is thermally unstable
- C It is prone to self-resonance
- D It has limited power handling capability

A-007-001-008 (A)

How does a network transform one impedance to another?

- A It cancels the reactive part of an impedance and changes the resistive part
- B It produces transconductance to cancel the reactive part of an impedance
- C It introduces negative resistance to cancel the resistive part of an impedance
- D Network resistances substitute for load resistances

A-007-001-009 (D)

What advantage does a pi-L network have over a pi-network for impedance matching between a vacuum tube linear amplifier and a multiband antenna?

- A Higher efficiency
- B Lower losses
- C Greater transformation range
- D Greater harmonic suppression

A-007-001-010 (D)

Which type of network provides the greatest harmonic suppression?

- A Inverse pi-network
- B Pi-network
- C L-network
- D Pi-L network

A-007-001-011 (B)

A Smith Chart is useful:

- A because it only works with complex numbers
- B because it simplifies mathematical operations
- C only to solve matching and transmission line problems
- D to solve problems in direct current circuits

A-007-002-001 (A)

What kind of impedance does a quarter wavelength transmission line present to the source when the line is shorted at the far end?

- A A very high impedance
- B The same as the characteristic impedance of the transmission line
- C The same as the output impedance of the source
- D A very low impedance

A-007-002-002 (A)

What kind of impedance does a quarter wavelength transmission line present to the source if the line is open at the far end?

- A A very low impedance
- B A very high impedance
- C The same as the output impedance of the source
- D The same as the characteristic impedance of the transmission line

A-007-002-003 (D)

What kind of impedance does a half wavelength transmission line present to the source when the line is open at the far end?

- A The same as the characteristic impedance of the transmission line
- B The same as the output impedance of the source
- C A very low impedance
- D A very high impedance

A-007-002-004 (C)

What kind of impedance does a half wavelength transmission line present to the source when the line is shorted at the far end?

- A The same as the characteristic impedance of the transmission line
- B The same as the output impedance of the source
- C A very low impedance
- D A very high impedance

A-007-002-005 (D)

What is the velocity factor of a transmission line?

- A The velocity of the wave on the transmission line multiplied by the velocity of light in a vacuum
- B The index of shielding for coaxial cable
- C The ratio of the characteristic impedance of the line to the terminating impedance
- D The velocity of the wave on the transmission line divided by the velocity of light

A-007-002-006 (D)

What is the term for the ratio of the actual velocity at which a signal travels through a transmission line to the speed of light in a vacuum?

- A Characteristic impedance
- B Surge impedance
- C Standing wave ratio
- D Velocity factor

A-007-002-007 (C)

What is a typical velocity factor for coaxial cable with polyethylene dielectric?

- A 0.1
- B 2.7
- C 0.66
- D 0.33

A-007-002-008 (A)

What determines the velocity factor in a transmission line?

- A Dielectrics in the line
- B The line length
- C The centre conductor resistivity
- D The terminal impedance

A-007-002-009 (C)

Why is the physical length of a coaxial cable shorter than its electrical length?

- A Skin effect is less pronounced in the coaxial cable
- B The characteristic impedance is higher in a parallel transmission line
- C RF energy moves slower along the coaxial cable than in air
- D The surge impedance is higher in the parallel transmission line

A-007-002-010 (C)

The reciprocal of the square root of the dielectric constant of the material used to separate the conductors in a transmission line gives the \_\_\_\_\_ of the line:

- A impedance
- B hermetic losses
- C velocity factor
- D VSWR

A-007-002-011 (D)

The velocity factor of a transmission line is the:

- A impedance of the line, e.g. 50 ohm, 75 ohm, etc.
- B speed at which the signal travels in free space
- C speed to which the standing waves are reflected back to the transmitter
- D ratio of the velocity of propagation in the transmission line to the velocity of propagation in free space

A-007-003-001 (B)

What term describes a method used to match a high-impedance transmission line to a lower impedance antenna by connecting the line to the driven element in two places, spaced a fraction of a wavelength on each side of the driven element centre?

- A The stub match
- B The T match
- C The gamma match
- D The omega match

A-007-003-002 (C)

What term describes an unbalanced feed system in which the driven element of an antenna is fed both at the centre and a fraction of a wavelength to one side of centre?

- A The stub match
- B The T match
- C The gamma match
- D The omega match

A-007-003-003 (A)

What term describes a method of antenna impedance matching that uses a short section of transmission line connected to the antenna transmission line near the antenna and perpendicular to the transmission line?

- A The stub match
- B The omega match
- C The delta match
- D The gamma match

A-007-003-004 (D)

Assuming a velocity factor of 0.66 what would be the physical length of a typical coaxial stub that is electrically one quarter wavelength long at 14.1 MHz?

- A 20 metres (65.6 feet)
- B 2.33 metres (7.64 feet)
- C 0.25 metre (0.82 foot)
- D 3.51 metres (11.5 feet)

A-007-003-005 (A)

The driven element of a Yagi antenna is connected to a coaxial transmission line. The coax braid is connected to the centre of the driven element and the centre conductor is connected to a variable capacitor in series with an adjustable mechanical arrangement on one side of the driven element. The type of matching is:

- A gamma match
- B lambda match
- C T match
- D zeta match

A-007-003-006 (B)

A quarter-wave stub, for use at 15 MHz, is made from a coaxial cable having a velocity factor of 0.8. Its physical length will be:

- A 7.5 m (24.6 ft)
- B 4 m (13.1 ft)
- C 12 m (39.4 ft)
- D 8 m (26.2 ft)

A-007-003-007 (D)

The matching of a driven element with a single adjustable mechanical and capacitive arrangement is descriptive of:

- A a "T" match
- B an "omega" match
- C a "Y" match
- D a "gamma" match

A-007-003-008 (C)

A Yagi antenna uses a gamma match. The coaxial braid connects to:

- A the adjustable gamma rod
- B the centre of the reflector
- C the centre of the driven element
- D the variable capacitor

A-007-003-009 (B)

A Yagi antenna uses a gamma match. The centre of the driven element connects to:

- A a variable capacitor
- B the coaxial line braid
- C the coaxial line centre conductor
- D the adjustable gamma rod

A-007-003-010 (B)

A Yagi antenna uses a gamma match. The adjustable gamma rod connects to:

- A the centre of the driven element
- B the variable capacitor
- C the coaxial line centre conductor
- D an adjustable point on the reflector

A-007-003-011 (B)

A Yagi antenna uses a gamma match. The variable capacitor connects to the:

- A coaxial line braid
- B adjustable gamma rod
- C an adjustable point on the director
- D center of the driven element

A-007-004-001 (B)

In a half-wave dipole, the distribution of \_\_\_\_\_ is highest at each end.

- A capacitance
- B voltage
- C current
- D inductance

A-007-004-002 (A)

In a half-wave dipole, the distribution of \_\_\_\_\_ is lowest at each end.

- A current
- B voltage
- C inductance
- D capacitance

A-007-004-003 (D)

The feed point in a centre-fed half-wave antenna is at the point of:

- A minimum current
- B minimum voltage and current
- C maximum voltage
- D maximum current

A-007-004-004 (C)

In a half-wave dipole, the lowest distribution of \_\_\_\_\_ occurs at the middle.

- A inductance
- B current
- C voltage
- D capacity

A-007-004-005 (A)

In a half-wave dipole, the highest distribution of \_\_\_\_\_ occurs at the middle.

- A current
- B inductance
- C voltage
- D capacity

A-007-004-006 (A)

A half-wave dipole antenna is normally fed at the point where:

- A the current is maximum
- B the voltage is maximum
- C the resistance is maximum
- D the antenna is resonant

A-007-004-007 (A)

At the ends of a half-wave dipole:

- A voltage is high and current is low
- B voltage and current are both high
- C voltage and current are both low
- D voltage is low and current is high

A-007-004-008 (A)

The impedance of a half-wave antenna at its centre is low, because at this point:

- A voltage is low and current is high
- B voltage and current are both high
- C voltage and current are both low
- D voltage is high and current is low

A-007-004-009 (B)

In a half-wave dipole, where does minimum voltage occur?

- A Both ends
- B The centre
- C At the right end
- D It is equal at all points

A-007-004-010 (D)

In a half-wave dipole, where does the minimum current occur?

- A At the centre
- B It is equal at all points
- C At the right end
- D At both ends

A-007-004-011 (D)

In a half-wave dipole, where does the minimum impedance occur?

- A It is the same at all points
- B At the right end
- C At both ends
- D At the centre

A-007-005-001 (A)

What is meant by circularly polarized electromagnetic waves?

- A Waves with a rotating electric field
- B Waves with an electric field bent into circular shape
- C Waves that circle the earth
- D Waves produced by a circular loop antenna

A-007-005-002 (B)

What type of polarization is produced by crossed dipoles fed 90 degrees out of phase?

- A None of the other answers, the two fields cancel out
- B Circular polarization
- C Cross-polarization
- D Perpendicular polarization

A-007-005-003 (B)

Which of these antennas does not produce circular polarization?

- A Axial-mode helical antenna
- B Loaded helical-wound antenna
- C Crossed dipoles fed 90 degrees out of phase
- D Lindenblad antenna

A-007-005-004 (D)

On VHF/UHF frequencies, Doppler shift becomes of consequence on which type of communication?

- A Contact through a hilltop repeater
- B Simplex line-of-sight contact between hand-held transceivers
- C Contact with terrestrial mobile stations
- D Contact via satellite

A-007-005-005 (A)

For VHF and UHF signals over a fixed path, what extra loss can be expected when linearly-polarized antennas are crossed-polarized (90 degrees)?

- A 20 dB or more
- B 3 dB
- C 6 dB
- D 10 dB

A-007-005-006 (C)

Which of the following is NOT a valid parabolic dish illumination arrangement?

- A Offset feed
- B Cassegrain
- C Newtonian
- D Front feed

A-007-005-007 (A)

A parabolic antenna is very efficient because:

- A all the received energy is focused to a point where the pick-up antenna is located
- B a dipole antenna can be used to pick up the received energy
- C no impedance matching is required
- D a horn-type radiator can be used to trap the received energy

A-007-005-008 (C)

A helical-beam antenna with right-hand polarization will best receive signals with:

- A vertical polarization only
- B horizontal polarization
- C right-hand polarization
- D left-hand polarization

A-007-005-009 (D)

One antenna which will respond simultaneously to vertically- and horizontally-polarized signals is the:

- A folded dipole antenna
- B ground-plane antenna
- C quad antenna
- D helical-beam antenna

A-007-005-010 (B)

In amateur work, what is the surface error upper limit you should try not to exceed on a parabolic reflector?

- A 1% of the diameter
- B 0.1 lambda
- C 0.25 lambda
- D 5 mm (0.2 in) regardless of frequency

A-007-005-011 (C)

You want to convert a surplus parabolic dish for amateur radio use, the gain of this antenna depends on:

- A the focal length of the antenna
- B the material composition of the dish
- C the diameter of the antenna in wavelengths
- D the polarization of the feed device illuminating it

A-007-006-001 (D)

A transmitter has an output of 100 watts. The cable and connectors have a composite loss of 3 dB, and the antenna has a gain of 6 dBd. What is the Effective Radiated Power?

- A 350 watts
- B 400 watts
- C 300 watts
- D 200 watts

A-007-006-002 (C)

As standing wave ratio rises, so does the loss in the transmission line. This is caused by:

- A high antenna voltage
- B leakage to ground through the dielectric
- C dielectric and conductor heat losses
- D high antenna currents

A-007-006-003 (B)

What is the Effective Radiated Power of an amateur transmitter, if the transmitter output power is 200 watts, the transmission line loss is 5 watts, and the antenna power gain is 3 dBd?

- A 178 watts
- B 390 watts
- C 197 watts
- D 228 watts

A-007-006-004 (D)

Effective Radiated Power means the:

- A power supplied to the antenna before the modulation of the carrier
- B power supplied to the transmission line plus antenna gain
- C ratio of signal output power to signal input power
- D transmitter output power, minus line losses, plus antenna gain relative to a dipole

A-007-006-005 (D)

A transmitter has an output power of 200 watts. The coaxial and connector losses are 3 dB in total, and the antenna gain is 9 dBd. What is the approximate Effective Radiated Power of this system?

- A 3200 watts
- B 1600 watts
- C 400 watts
- D 800 watts

A-007-006-006 (D)

A transmitter has a power output of 100 watts. There is a loss of 1.30 dB in the transmission line, a loss of 0.2 dB through the antenna tuner, and a gain of 4.50 dBd in the antenna. The Effective Radiated Power (ERP) is:

- A 800 watts
- B 400 watts
- C 100 watts
- D 200 watts

A-007-006-007 (A)

If the overall gain of an amateur station is increased by 3 dB the ERP (Effective Radiated Power) will:

- A double
- B decrease by 3 watts
- C remain the same
- D be cut in half

A-007-006-008 (D)

A transmitter has a power output of 125 watts. There is a loss of 0.8 dB in the transmission line, 0.2 dB in the antenna tuner, and a gain of 10 dBd in the antenna. The Effective Radiated Power (ERP) is:

- A 1250
- B 1125
- C 134
- D 1000

A-007-006-009 (D)

If a 3 dBd gain antenna is replaced with a 9 dBd gain antenna, with no other changes, the Effective Radiated Power (ERP) will increase by:

- A 6
- B 1.5
- C 2
- D 4

A-007-006-010 (C)

A transmitter has an output of 2000 watts PEP. The transmission line, connectors and antenna tuner have a composite loss of 1 dB, and the gain from the stacked Yagi antenna is 10 dBd. What is the Effective Radiated Power (ERP) in watts PEP?

- A 20 000
- B 2009
- C 16 000
- D 18 000

A-007-006-011 (A)

A transmitter has an output of 1000 watts PEP. The coaxial cable, connectors and antenna tuner have a composite loss of 1 dB, and the antenna gain is 10 dBd. What is the Effective Radiated Power (ERP) in watts PEP?

- A 8000
- B 1009
- C 10 000
- D 9000

A-007-007-001 (C)

For a 3-element Yagi antenna with horizontally mounted elements, how does the main lobe takeoff angle vary with height above flat ground?

- A It does not vary with height
- B It depends on E-region height, not antenna height
- C It decreases with increasing height
- D It increases with increasing height

A-007-007-002 (A)

Most simple horizontally polarized antennas do not exhibit significant directivity unless they are:

- A a half wavelength or more above the ground
- B an eighth of a wavelength above the ground
- C a quarter wavelength above the ground
- D three-eighths of a wavelength above the ground

A-007-007-003 (A)

The plane from which ground reflections can be considered to take place, or the effective ground plane for an antenna is:

- A several centimeters to as much as 2 meters below ground, depending upon soil conditions
- B as much as 6 cm below ground depending upon soil conditions
- C as much as a meter above ground
- D at ground level exactly

A-007-007-004 (D)

Why is a ground-mounted vertical quarter-wave antenna in reasonably open surroundings better for long distance contacts than a half-wave dipole at a quarter wavelength above ground?

- A The radiation resistance is lower
- B It has an omnidirectional characteristic
- C It uses vertical polarization
- D The vertical radiation angle is lower

A-007-007-005 (B)

When a half-wave dipole antenna is installed one-half wavelength above ground, the:

- A radiation pattern is unaffected
- B vertical or upward radiation is effectively cancelled
- C radiation pattern changes to produce side lobes at 15 and 50 degrees
- D side lobe radiation is cancelled

A-007-007-006 (C)

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

- A If the antenna is less than one-half wavelength high, radiation off the ends of the wire is eliminated
- B If the antenna is too high, the pattern becomes unpredictable
- C If the antenna is less than one-half wavelength high, reflected radio waves from the ground significantly distort the pattern
- D Antenna height has no effect on the pattern

A-007-007-007 (B)

For long distance propagation, the vertical radiation angle of the energy from the antenna should be:

- A more than 30 degrees but less than 45 degrees
- B less than 30 degrees
- C more than 45 degrees but less than 90 degrees
- D 90 degrees

A-007-007-008 (A)

Greater distance can be covered with multiple-hop transmissions by decreasing the:

- A vertical radiation angle of the antenna
- B power applied to the antenna
- C main height of the antenna
- D length of the antenna

A-007-007-009 (A)

The impedance at the centre of a dipole antenna more than 3 wavelengths above ground would be nearest to:

- A 75 ohms
- B 25 ohms
- C 300 ohms
- D 600 ohms

A-007-007-010 (B)

Why can a horizontal antenna closer to ground be advantageous for close range communications on lower HF bands?

- A The radiation resistance is higher
- B The ground tends to act as a reflector
- C Lower antenna noise temperature
- D Low radiation angle for closer distances

A-007-007-011 (A)

Which antenna system and operating frequency are most suitable for Near Vertical Incidence (NVIS) communications?

- A A horizontal antenna less than 1/4 wavelength above ground and a frequency below the current critical frequency
- B A horizontal antenna at a height of half a wavelength and an operating frequency at the optimum working frequency
- C A vertical antenna and a frequency below the maximum usable frequency
- D A vertical antenna and a frequency above the lowest usable frequency

A-007-008-001 (D)

What is meant by the radiation resistance of an antenna?

- A The resistance in the atmosphere that an antenna must overcome to be able to radiate a signal
- B The specific impedance of an antenna
- C The combined losses of the antenna elements and transmission line
- D The equivalent resistance that would dissipate the same amount of power as that radiated from an antenna

A-007-008-002 (B)

Why would one need to know the radiation resistance of an antenna?

- A To calculate the front-to-back ratio of the antenna
- B To match impedances for maximum power transfer
- C To measure the near-field radiation density from a transmitting antenna
- D To calculate the front-to-side ratio of the antenna

A-007-008-003 (B)

What factors determine the radiation resistance of an antenna?

- A It is a physical constant and is the same for all antennas
- B Antenna location with respect to nearby objects and the conductors length/diameter ratio
- C Transmission line length and antenna height
- D Sunspot activity and time of day

A-007-008-004 (B)

What is the term for the ratio of the radiation resistance of an antenna to the total resistance of the system?

- A Radiation conversion loss
- B Antenna efficiency
- C Beamwidth
- D Effective Radiated Power

A-007-008-005 (B)

What is included in the total resistance of an antenna system?

- A Radiation resistance plus space impedance
- B Radiation resistance plus ohmic resistance
- C Radiation resistance plus transmission resistance
- D Transmission line resistance plus radiation resistance

A-007-008-006 (D)

How can the approximate beamwidth of a beam antenna be determined?

- A Draw two imaginary lines through the ends of the elements and measure the angle between the lines
- B Measure the ratio of the signal strengths of the radiated power lobes from the front and side of the antenna
- C Measure the ratio of the signal strengths of the radiated power lobes from the front and rear of the antenna
- D Note the two points where the signal strength is down 3 dB from the maximum signal point and compute the angular difference

A-007-008-007 (C)

How is antenna percent efficiency calculated?

- A  $(\text{total resistance} / \text{radiation resistance}) \times 100$
- B  $(\text{effective radiated power} / \text{transmitter output}) \times 100$
- C  $(\text{radiation resistance} / \text{total resistance}) \times 100$
- D  $(\text{radiation resistance} / \text{transmission resistance}) \times 100$

A-007-008-008 (D)

What is the term used for an equivalent resistance which would dissipate the same amount of energy as that radiated from an antenna?

- A j factor
- B Antenna resistance
- C K factor
- D Radiation resistance

A-007-008-009 (C)

Antenna beamwidth is the angular distance between:

- A the 6 dB power points on the major lobe
- B the 3 dB power points on the first minor lobe
- C the points on the major lobe at the half-power points
- D the maximum lobe spread points on the major lobe

A-007-008-010 (D)

If the ohmic resistance of a half-wave dipole is 2 ohms, and the radiation resistance is 72 ohms, what is the antenna efficiency?

- A 74%
- B 72%
- C 100%
- D 97.3%

A-007-008-011 (D)

If the ohmic resistance of a miniloop antenna is 2 milliohms and the radiation resistance is 50 milliohms, what is the antenna efficiency?

- A 52%
- B 25%
- C 50%
- D 96.15%

A-007-009-001 (A)

Waveguide is typically used:

- A at frequencies above 3000 MHz
- B at frequencies above 2 MHz
- C at frequencies below 150 MHz
- D at frequencies below 1500 MHz

A-007-009-002 (D)

Which of the following is not correct?

Waveguide is an efficient transmission medium because it features:

- A low radiation loss
- B low dielectric loss
- C low copper loss
- D low hysteresis loss

A-007-009-003 (A)

Which of the following is an advantage of waveguide as a transmission line?

- A Low loss
- B Frequency sensitive based on dimensions
- C Expensive
- D Heavy and difficult to install

A-007-009-004 (B)

For rectangular waveguide to transfer energy, the cross-section should be at least:

- A one-quarter wavelength
- B one-half wavelength
- C three-eighths wavelength
- D one-eighth wavelength

A-007-009-005 (D)

Which of the following statements about waveguide IS NOT correct?

- A In the transverse electric mode, a component of the magnetic field is in the direction of propagation
- B In the transverse magnetic mode, a component of the electric field is in the direction of propagation
- C Waveguide has low loss at high frequencies, but high loss below cutoff frequency
- D Waveguide has high loss at high frequencies, but low loss below cutoff frequency

A-007-009-006 (A)

Which of the following is a major advantage of waveguide over coaxial cable for use at microwave frequencies?

- A Very low losses
- B Frequency response from 1.8 MHz to 24GHz
- C Easy to install
- D Inexpensive to install

A-007-009-007 (D)

What is printed circuit transmission line called?

- A Dielectric substrate
- B Dielectric imprinting
- C Ground plane
- D Microstripline

A-007-009-008 (C)

Compared with coaxial cable, microstripline:

- A must have much lower characteristic impedance
- B must have much higher characteristic impedance
- C has poorer shielding
- D has superior shielding

A-007-009-009 (A)

A section of waveguide:

- A operates like a high-pass filter
- B operates like a low-pass filter
- C operates like a band-stop filter
- D is lightweight and easy to install

A-007-009-010 (C)

Stripline is a:

- A high power microwave antenna
- B family of fluids for removing coatings from small parts
- C printed circuit transmission line
- D small semiconductor family

A-007-009-011 (B)

What precautions should you take before beginning repairs on a microwave feed horn or waveguide?

- A Be sure to wear tight-fitting clothes and gloves to protect your body and hands from sharp edges
- B Be sure the transmitter is turned off and the power source is disconnected
- C Be sure the weather is dry and sunny
- D Be sure propagation conditions are unfavourable for tropospheric ducting