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Advanced Qualification Question Bank for Amateur Radio Operator Certificate Examinations

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Canada

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All spectrum publications are available on the Internet at:
http://strategis.ic.gc.ca/spectrum

Foreword

This circular contains the questions that will be used effective April 1, 2007, for making *Basic 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-001-01-01 **(4)**

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

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

Radio Amateur du Québec inc.
4545 Pierre-de-Coubertin Avenue
C.P. 1000, Succursale M
Montréal, Quebec
H1V 3R2
www.raqi.qc.ca

A-001-01-01 (4)
What is the meaning of the term "time constant" in an RL circuit?
The time required for the current in the circuit to build up to 36.8% of the maximum value
The time required for the voltage in the circuit to build up to 63.2% of the maximum value
The time required for the voltage in the circuit to build up to 36.8% of the maximum value
The time required for the current in the circuit to build up to 63.2% of the maximum value

A-001-01-02 (2)
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?
An exponential rate of one
One time constant
A time factor of one
One exponential period

A-001-01-03 (1)
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?
One time constant
An exponential period of one
A time factor of one
One exponential rate

A-001-01-04 (3)
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 discharge factor of one
An exponential discharge of one
One time constant
One discharge period

A-001-01-05 (2)
What is meant by "back EMF"?
A current that opposes the applied EMF
A voltage that opposes the applied EMF
An opposing EMF equal to R times C percent of the applied EMF
A current equal to the applied EMF

A-001-01-06 (2)
After two time constants, the capacitor in an RC circuit is charged to what percentage of the supply voltage?
63.2%
86.5%
95%
36.8%

A-001-01-07 (1)
After two time constants, the capacitor in an RC circuit is discharged to what percentage of the starting voltage?
13.5%
36.8%
86.5%
63.2%

A-001-01-08 (4)
What is the time constant of a circuit having a 100 microfarad capacitor in series with a 470 kilohm resistor?
4700 seconds
470 seconds
0.47 seconds
47 seconds

A-001-01-09 (3)
What is the time constant of a circuit having a 470 microfarad capacitor in series with a 470 kilohm resistor?
221 000 seconds
47 000 seconds
221 seconds
470 seconds

A-001-01-10 (3)
What is the time constant of a circuit having a 220 microfarad capacitor in series with a 470 kilohm resistor?
470 000 seconds
470 seconds
103 seconds
220 seconds

A-001-02-01 (1)
What is the result of skin effect?
As frequency increases, RF current flows in a thinner layer of the conductor, closer to the surface
As frequency decreases, RF current flows in a thinner layer of the conductor, closer to the surface
Thermal effects on the surface of the conductor increase impedance
Thermal effects on the surface of the conductor decrease impedance

A-001-02-02 (3)
What effect causes most of an RF current to flow along the surface of a conductor?
Piezoelectric effect
Resonance effect
Skin effect
Layer effect

A-001-02-03 (3)
Where does almost all RF current flow in a conductor?
In a magnetic field in the centre of the conductor
In a magnetic field around the conductor
Along the surface of the conductor
In the centre of the conductor

A-001-02-04 (2)
Why does most of an RF current flow within a very thin layer under the conductor's surface?
Becasue the RF resistance of a conductor is much less than the DC resistance
Because of skin effect
Because a conductor has AC resistance due to self- inductance
Because of heating of the conductor's interior

A-001-02-05 (1)
Why is the resistance of a conductor different for RF currents than for direct currents?
Because of skin effect
Because of the Hertzberg effect
Because conductors are non- linear devices
Because the insulation conducts current at high frequencies

A-001-02-06 (4)
What unit measures the capacity to store electrical energy in an electrostatic field?
Coulomb
Watt
Volt
Farad

A-001-02-07 (4)
What is an electromagnetic field?
Current through the space around a permanent magnet
The force that drives current through a conductor
The current between the plates of a charged capacitor
The space around a conductor, through which a magnetic force acts

A-001-02-08 (1)
In what direction is the magnetic field oriented about a conductor in relation to the direction of electron flow?
In the direction determined by the left-hand rule
In all directions
In the same direction as the current
In the direct opposite to the current

A-001-02-09 (1)
What is the term for energy that is stored in an electromagnetic or electrostatic field?
Potential energy
Kinetic energy
Ampere-joules
Joule-coulombs

A-001-02-10 (1)
What is an electrostatic field?
The current between the plates of a charged capacitor
The space around a conductor, through which a magnetic force acts
Current through the space around a permanent magnet
The force that drives current through a conductor

A-001-02-11 (4)
What unit measures the capacity to store electrical energy in an electromagnetic field?
Coulomb
Farad
Watt
Henry

A-001-03-01 (2)
What is the resonant frequency of a series R-L-C circuit if R is 47 ohms, L is 50 microhenrys and C is 40 picofarads?
1.78 MHz
3.56 MHz
7.96 MHz
79.6 MHz

A-001-03-02 (4)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 40 microhenrys and C is 200 picofarads?
1.99 kHz
1.99 MHz
1.78 kHz
1.78 MHz

A-001-03-03 (4)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 50 microhenrys and C is 10 picofarads?
7.12 kHz
3.18 MHz
3.18 kHz
7.12 MHz

A-001-03-04 (4)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 25 microhenrys and C is 10 picofarads?
63.7 MHz
10.1 kHz
63.7 kHz
10.1 MHz

A-001-03-05 (2)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 3 microhenrys and C is 40 picofarads?
13.1 MHz
14.5 MHz
13.1 kHz
14.5 kHz

A-001-03-06 (2)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 4 microhenrys and C is 20 picofarads?
19.9 MHz
17.8 MHz
19.9 kHz
17.8 kHz

A-001-03-07 (2)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 8 microhenrys and C is 7 picofarads?
28.4 MHz
21.3 MHz
2.84 MHz
2.13 MHz

A-001-03-08 (2)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 3 microhenrys and C is 15 picofarads?
35.4 MHz
23.7 MHz
35.4 kHz
23.7 kHz

A-001-03-09 (2)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 4 microhenrys and C is 8 picofarads?
49.7 MHz
28.1 MHz
49.7 kHz
28.1 kHz

A-001-03-10 (1)
What is the resonant frequency of a series R-L-C circuit, if R is 47 ohms, L is 1 microhenry and C is 9 picofarads?
53.1 MHz
5.31 MHz
17.7 MHz
1.77 MHz

A-001-03-11 (3)
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?
2.2 microfarads
44 microfarads
44 picofarads
2.2 picofarads

A-001-04-01 (2)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 1 microhenry and C is 10 picofarads?
15.9 kHz
50.3 MHz
50.3 kHz
15.9 MHz

A-001-04-02 (1)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 2 microhenrys and C is 15 picofarads?
29.1 MHz
29.1 kHz
5.31 MHz
5.31 kHz

A-001-04-03 (4)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 5 microhenrys and C is 9 picofarads?
23.7 kHz
3.54 MHz
3.54 kHz
23.7 MHz

A-001-04-04 (2)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 2 microhenrys and C is 30 picofarads?
2.65 MHz
20.5 MHz
2.65 kHz
20.5 kHz

A-001-04-05 (3)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 15 microhenrys and C is 5 picofarads?
2.12 kHz
2.12 MHz
18.4 MHz
18.4 kHz

A-001-04-06 (3)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 3 microhenrys and C is 40 picofarads?
1.33 kHz
1.33 MHz
14.5 MHz
14.5 kHz

A-001-04-07 (2)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 40 microhenrys and C is 6 picofarads?
6.63 MHz
. 10.3 MHz
6.63 kHz
10.3 kHz

A-001-04-08 (1)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 10 microhenrys and C is 50 picofarads?
7.12 MHz
7.12 kHz
3.18 MHz
3.18 kHz

A-001-04-09 (4)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 200 microhenrys and C is 10 picofarads?
3.56 kHz
7.96 MHz
7.96 kHz
3.56 MHz

A-001-04-10 (3)
What is the resonant frequency of a parallel R-L-C circuit if R is 4.7 kilohms, L is 90 microhenrys and C is 100 picofarads?
1.77 kHz
1.77 MHz
1.68 MHz
1.68 kHz

A-001-04-11 (4)
What is the value of inductance (L) in a parallel R-L-C circuit, if the resonant frequency is 14.25 MHz and C is 44 picofarads?
253.8 millihenrys
3.9 millihenrys
0.353 microhenry
2.8 microhenrys

A-001-05-01 (4)
What is the Q of a parallel R- L-C circuit, if it is resonant at 14.128 MHz, L is 2.7 microhenrys and R is 18 kilohms?
7.51
0.013
71.5
75.1

A-001-05-02 (2)
What is the Q of a parallel R- L-C circuit, if it is resonant at 14.128 MHz, L is 4.7 microhenrys and R is 18 kilohms?
13.3
43.1
0.023
4.31

A-001-05-03 (1)
What is the Q of a parallel R- L-C circuit, if it is resonant at 4.468 MHz, L is 47 microhenrys and R is 180 ohms?
0.136
7.35
0.00735
13.3

A-001-05-04 (2)
What is the Q of a parallel R- L-C circuit, if it is resonant at 14.225 MHz, L is 3.5 microhenrys and R is 10 kilohms?
7.35
31.9
0.0319
71.5

A-001-05-05 (1)
What is the Q of a parallel R- L-C circuit, if it is resonant at 7.125 MHz, L is 8.2 microhenrys and R is 1 kilohm?
2.73
36.8
0.368
0.273

A-001-05-06 (3)
What is the Q of a parallel R- L-C circuit, if it is resonant at 7.125 MHz, L is 10.1 microhenrys and R is 100 ohms?
22.1
0.00452
0.221
4.52

A-001-05-07 (1)
What is the Q of a parallel R- L-C circuit, if it is resonant at 7.125 MHz, L is 12.6 microhenrys and R is 22 kilohms?
39
22.1
0.0256
25.6

A-001-05-08 (3)
What is the Q of a parallel R- L-C circuit, if it is resonant at 3.625 MHz, L is 3 microhenrys and R is 2.2 kilohms?
25.6
31.1
32.2
0.031

A-001-05-09 (3)
What is the Q of a parallel R- L-C circuit, if it is resonant at 3.625 MHz, L is 42 microhenrys and R is 220 ohms?
2.3
4.35
0.23
0.00435

A-001-05-10 (4)
What is the Q of a parallel R- L-C circuit, if it is resonant at 3.625 MHz, L is 43 microhenrys and R is 1.8 kilohms?
0.543
54.3
23
1.84

A-001-05-11 (4)
Why is a resistor often included in a parallel resonant circuit?
To increase the Q and decrease the skin effect
To decrease the Q and increase the resonant frequency
To increase the Q and decrease bandwidth
To decrease the Q and increase the bandwidth

A-002-01-01 (2)
What two elements widely used in semiconductor devices exhibit both metallic and non- metallic characteristics?
Galena and germanium
Silicon and germanium
Galena and bismuth
Silicon and gold

A-002-01-02 (2)
In what application is gallium-arsenide used as a semiconductor material in preference to germanium or silicon?
In high-power circuits
At microwave frequencies
At very low frequencies
In bipolar transistors

A-002-01-03 (1)
What type of semiconductor material contains fewer free electrons than pure germanium or silicon crystals?
P-type
N-type
Bipolar type
Superconductor type

A-002-01-04 (1)
What type of semiconductor material contains more free electrons than pure germanium or silicon crystals?
N-type
P-type
Bipolar
Superconductor

A-002-01-05 (3)
What are the majority charge carriers in P-type semiconductor material?
Free electrons
Free protrons
Holes
Free neutrons

A-002-01-06 (4)
What are the majority charge carriers in N-type semiconductor material?
Holes
Free protrons
Free neutrons
Free electrons

A-002-01-07 (2)
Silicon, in its pure form, is:
a superconductor
an insulator
a semiconductor
conductor

A-002-01-08 (4)
An element which is sometimes an insulator and sometimes a conductor is called a:
intrinsic conductor
N-type conductor
P-type conductor
semiconductor

A-002-01-09 (3)
Which of the following materials is used to make a semiconductor?
tantalum
copper
silicon
sulphur

A-002-01-10 (4)
Substances such as silicon in a pure state are usually good:
conductors
tuned circuits
inductors
insulators

A-002-01-11 (4)
A semiconductor is said to be doped when it has added to it small quantities of:
protons
ions
electrons
impurities

A-002-02-01 (4)
What is the principal characteristic of a zener diode?
A constant current under conditions of varying voltage
A negative resistance region
An internal capacitance that varies with the applied voltage
A constant voltage under conditions of varying current

A-002-02-02 (1)
What type of semiconductor diode varies its internal capacitance as the voltage applied to its terminals varies?
Varactor
Zener
Silicon-controlled rectifier
Hot-carrier

A-002-02-03 (1)
What is a common use for the hot-carrier diode?
As VHF and UHF mixers and detectors
As balanced mixers in FM generation
As a variable capacitance in an automatic frequency control circuit
As a constant voltage reference in a power supply

A-002-02-04 (2)
What limits the maximum forward current in a junction diode?
Forward voltage
Junction temperature
Back EMF
Peak inverse voltage

A-002-02-05 (3)
What are the major ratings for junction diodes?
Maximum reverse current and capacitance
Maximum forward current and capacitance
Maximum forward current and PIV
Maximum reverse current and PIV

A-002-02-06 (3)
Structurally, what are the two main categories of semiconductor diodes?
Vacuum and point contact
Electrolytic and point contact
Junction and point contact
Electrolytic and junction

A-002-02-07 (3)
What is a common use for point contact diodes?
As a constant current source
As a constant voltage source
As an RF detector
As a high voltage rectifier

A-002-02-08 (2)
What is one common use for PIN diodes?
As a constant current source
As an RF switch
As a high voltage rectifier
As a constant voltage source

A-002-02-09 (1)
A Zener diode is a device used to:
regulate voltage
dissipate voltage
decrease current
increase current

A-002-02-10 (3)
If a Zener diode rated at 10 V and 50 watts were operated at maximum dissipation rating, it would conduct ____ amperes:
50
0.05
5
0.5

A-002-02-11 (2)
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:
the same
less
much greater
slightly greater

A-002-03-01 (2)
What is the alpha of a bipolar transistor?
The change of collector current with respect to base current
The change of collector current with respect to emitter current
The change of base current with respect to collector current
The change of collector current with respect to gate current

A-002-03-02 (4)
What is the beta of a bipolar transistor?
The change of base current with respect to emitter current
The change of collector current with respect to emitter current
The change of base current with respect to gate current
The change of collector current with respect to base current

A-002-03-03 (3)
Which component conducts electricity from a negative emitter to a positive collector when its base voltage is made positive?
A varactor
A triode vacuum tube
An NPN transistor
A PNP transistor

A-002-03-04 (4)
What is the alpha of a bipolar transistor in common base configuration?
Forward voltage gain
Reverse current gain
Reverse voltage gain
Forward current gain

A-002-03-05 (2)
In a bipolar transistor, the change of collector current with respect to base current is called:
gamma
beta
delta
alpha

A-002-03-06 (2)
The alpha of a bipolar transistor is specified for what configuration?
Common collector
Common base
Common gate
Common emitter

A-002-03-07 (3)
The beta of a bipolar transistor is specified for what configurations?
Common emitter or common gate
Common base or common collector
Common emitter or common collector
Common base or common emitter

A-002-03-08 (2)
Which component conducts electricity from a positive emitter to a negative collector when its base is made negative?
A triode vacuum tube
A PNP transistor
A varactor
An NPN transistor

A-002-03-09 (2)
Alpha of a bipolar transistor is equal to :
beta X (1 + beta)
beta / (1 + beta)
beta X (1 - beta)
beta / (1 - beta)

A-002-03-10 (1)
The current gain of a bipolar transistor in common emitter or common collector compared to common base configuration is:
large to very large
very small
usually about double
usually about half

A-002-03-11 (1)
Beta of a bipolar transistor is equal to:
alpha / (1 - alpha)
alpha / (1 + alpha)
alpha X (1 - alpha)
alpha X (1 + alpha)

A-002-04-01 (1)
What is an enhancement-mode FET?
An FET without a channel; no current occurs with zero gate voltage
An FET with a channel that blocks voltage through the gate
An FET with a channel that allows current when the gate voltage is zero
An FET without a channel to hinder current through the gate

A-002-04-02 (2)
What is a depletion-mode FET?
An FET without a channel; no current flows with zero gate voltage
An FET that has a channel with no gate voltage applied; a current flows with zero gate voltage
An FET without a channel to hinder current through the gate
An FET that has a channel that blocks current when the gate voltage is zero

A-002-04-03 (3)
Why do many MOSFET devices have built-in gate protective Zener diodes?
The gate-protective Zener diode keeps the gate voltage within specifications to prevent the device from overheating
The gate-protective Zener diode protects the substrate from excessive voltages
The gate-protective Zener diode prevents the gate insulation from being punctured by small static charges or excessive voltages
The gate-protective Zener diode provides a voltage reference to provide the correct amount of reverse-bias gate voltage

A-002-04-04 (2)
Why are special precautions necessary in handling FET and CMOS devices?
They are light-sensitive
They are susceptible to damage from static charges
They have micro-welded semiconductor junctions that are susceptible to breakage
They have fragile leads that may break off

A-002-04-05 (4)
How does the input impedance of a field-effect transistor (FET) compare with that of a bipolar transistor?
One cannot compare input impedance without knowing supply voltage
An FET has low input impedance; a bipolar transistor has high input impedance
The input impedance of FETs and bipolar transistors is the same
An FET has high input impedance; a bipolar transistor has low input impedance

A-002-04-06 (3)
What are the three terminals of a junction field-effect transistor (JFET)?
Emitter, base 1, base 2
Emitter, base, collector
Gate, drain, source
Gate 1, gate 2, drain

A-002-04-07 (1)
What are the two basic types of junction field-effect transistors (JFET)?
N-channel and P-channel
High power and low power
MOSFET and GaAsFET
Silicon and germanium

A-002-04-08 (1)
Electron conduction in an n- channel depletion type MOSFET is associated with:
n-channel depletion
p-channel depletion
p-channel enhancement
q-channel enhancement

A-002-04-09 (3)
Electron conduction in an n- channel enhancement MOSFET is associated with:
q-channel depletion
p-channel enhancement
n-channel enhancement
p-channel depletion

A-002-04-10 (2)
Hole conduction in a p-channel depletion type MOSFET is associated with:
n-channel enhancement
p-channel depletion
q-channel depletion
n-channel depletion

A-002-04-11 (4)
Hole conduction in a p-channel enhancement type MOSFET is associated with:
n-channel depletion
n-channel enhancement
q-channel enhancement
p-channel enhancement

A-002-05-01 (3)
What are the three terminals of a silicon controlled rectifier (SCR)?
Gate, base 1 and base 2
Base, collector and emitter
Anode, cathode and gate
Gate, source and sink

A-002-05-02 (2)
What are the two stable operating conditions of a silicon controlled rectifier (SCR)?
Forward conducting and reverse conducting
Conducting and non- conducting
NPN conduction and PNP conduction
Oscillating and quiescent

A-002-05-03 (1)
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)?
The junction diode
The PIN diode
The hot-carrier diode
The varactor diode

A-002-05-04 (4)
Under what operating condition does a silicon controlled rectifier (SCR) exhibit electrical characteristics similar to a forward-biased silicon rectifier?
When it is gated "off"
When it is used as a detector
During a switching transition
When it is gated "on"

A-002-05-05 (1)
The silicon controlled rectifier (SCR) is what type of device?
PNPN
NPPN
PNNP
PPNN

A-002-05-06 (4)
The control element in the silicon controlled rectifier (SCR) is called the:
anode
cathode
emitter
gate

A-002-05-07 (3)
The silicon controlled rectifier (SCR) is a member of which family?
Phase locked loops
Varactors
Thyristors
Varistors

A-002-05-08 (1)
In amateur radio equipment, which is the major application for the silicon controlled rectifier (SCR)?
Power supply overvoltage "crowbar" circuit
Class C amplifier circuit
Microphone preamplifier circuit
SWR detector circuit

A-002-05-09 (2)
Which of the following devices has anode, cathode, and gate?
The bipolar transistor
The silicon controlled rectifier (SCR)
The field effect transistor
The triode vacuum tube

A-002-05-10 (4)
When it is gated "on", the silicon controlled rectifier (SCR) exhibits electrical characteristics similar to a:
reverse-biased silicon rectifier
forward-biased PIN diode
reverse-biased hot-carrier diode
forward-biased silicon rectifier

A-002-05-11 (4)
Which of the following is a PNPN device?
PIN diode
Hot carrier diode
Zener diode
Silicon controlled rectifier (SCR)

A-002-06-01 (3)
For what portion of a signal cycle does a Class A amplifier operate?
Exactly 180 degrees
More than 180 degrees but less than 360 degrees
The entire cycle
Less than 180 degrees

A-002-06-02 (1)
Which class of amplifier has the highest linearity and least distortion?
Class A
Class AB
Class B
Class C

A-002-06-03 (4)
For what portion of a cycle does a Class AB amplifier operate?
Exactly 180 degrees
The entire cycle
Less than 180 degrees
More than 180 degrees but less than 360 degrees

A-002-06-04 (3)
For what portion of a cycle does a Class B amplifier operate?
Less than 180 degrees
More than 180 degrees but less than 360 degrees
180 degrees
The entire cycle

A-002-06-05 (2)
For what portion of a signal cycle does a Class C amplifier operate?
More than 180 degrees but less than 360 degrees
Less than 180 degrees
The entire cycle
180 degrees

A-002-06-06 (1)
Which class of amplifier provides the highest efficiency?
Class C
Class A
Class AB
Class B

A-002-06-07 (1)
In order to provide the greatest efficiency in the output stage of a CW, RTTY or FM transmitter, you would operate the amplifier:
Class C
Class AB
Class B
Class A

A-002-06-08 (3)
Which class of amplifier provides the least efficiency?
Class C
Class B
Class A
Class AB

A-002-06-09 (2)
Which class of amplifier has the poorest linearity and the most distortion?
Class AB
Class C
Class A
Class B

A-002-06-10 (1)
Which class of amplifier operates over the full cycle?
Class A
Class AB
Class B
Class C

A-002-06-11 (2)
Which class of amplifier operates over less than 180 degrees of the cycle?
Class AB
Class C
Class A
Class B

A-002-07-01 (3)
What determines the input impedance of a FET common- source amplifier?
The input impedance is essentially determined by the resistance between the source and substrate
The input impedance is essentially determined by the resistance between the source and the drain
The input impedance is essentially determined by the gate biasing network
The input impedance is essentially determined by the resistance between the drain and substrate

A-002-07-02 (2)
What determines the output impedance of a FET common- source amplifier?
The output impedance is essentially determined by the drain supply voltage
The output impedance is essentially determined by the drain resistor
The output impedance is essentially determined by the gate supply voltage
The output impedance is essentially determined by the input impedance of the FET

A-002-07-03 (1)
What are the advantages of a Darlington pair audio amplifier?
High gain, high input impedance and low output impedance
Mutual gain, high stability and low mutual inductance
Mutual gain, low input impedance and low output impedance
Low output impedance, high mutual impedance and low output current

A-002-07-04 (2)
In the common base amplifier, when the input and output signals are compared :
the output signal lags the input signal by 90 degrees
the signals are in phase
the output signals leads the input signal by 90 degrees
the signals are 180 degrees out of phase

A-002-07-05 (3)
In the common base amplifier, the input impedance, when compared to the output impedance is:
only slightly higher
only slightly lower
very low
very high

A-002-07-06 (3)
In the common emitter amplifier, when the input and output signals are compared:
the output signal leads the input signal by 90 degrees
the output signal lags the input signal by 90 degrees
the signals are 180 degrees out of phase
the signals are in phase

A-002-07-07 (3)
In the common collector amplifier, when the input and output signals are compared:
the output signal leads the input signal by 90 degrees
the output signal lags the input signal by 90 degrees
the signals are in phase
the signals are 180 degrees out of phase

A-002-07-08 (2)
The FET amplifier source follower circuit is another name for:
common source circuit
common drain circuit
common mode circuit
common gate circuit

A-002-07-09 (4)
The FET amplifier common source circuit is similar to which of the following bipolar transistor amplifier circuits?
Common collector
Common base
Common mode
Common emitter

A-002-07-10 (1)
The FET amplifier common drain circuit is similar to which of the following bipolar transistor amplifier circuits?
Common collector
Common emitter
Common base
Common mode

A-002-07-11 (3)
The FET amplifier common gate circuit is similar to which of the following bipolar transistor amplifier circuits?
Common mode
Common collector
Common base
Common emitter

A-002-08-01 (4)
What is an operational amplifier (op-amp)?
A high-gain, direct-coupled audio amplifier whose characteristics are determined by components mounted externally
An amplifier used to increase the average output of frequency modulated amateur signals to the legal limit
A program subroutine that calculates the gain of an RF amplifier
A high-gain, direct-coupled differential amplifier whose characteristics are determined by components mounted externally

A-002-08-02 (2)
What would be the characteristics of the ideal op-amp?
Zero input impedance, zero output impedance, infinite gain, and flat frequency response
Infinite input impedance, zero output impedance, infinite gain, and flat frequency response
Infinite input impedance, infinite output impedance, infinite gain and flat frequency response
Zero input impedance, infinite output impedance, infinite gain, and flat frequency response

A-002-08-03 (3)
What determines the gain of a closed-loop op-amp circuit?
The PNP collector load
The power supply voltage
The external feedback network
The collector-to-base capacitance of the PNP stage

A-002-08-04 (2)
What is meant by the term op-amp offset voltage?
The difference between the output voltage of the op-amp and the input voltage required for the next stage
The potential between the amplifier input terminals of the op-amp in a closed-loop condition
The potential between the amplifier input terminals of the op-amp in an open-loop condition
The output voltage of the op-amp minus its input voltage

A-002-08-05 (4)
What is the input impedance of a theoretically ideal op-amp?
Very low
Exactly 100 ohms
Exactly 1000 ohms
Very high

A-002-08-06 (4)
What is the output impedance of a theoretically ideal op-amp?
Very high
Exactly 100 ohms
Exactly 1000 ohms
Very low

A-002-08-07 (4)
What are the advantages of using an op-amp instead of LC elements in an audio filter?
Op-amps are more rugged and can withstand more abuse than can LC elements
Op-amps are available in more styles and types than are LC elements
Op-amps are fixed at one frequency
Op-amps exhibit gain rather than insertion loss

A-002-08-08 (2)
What are the principal uses of an op-amp RC active filter in amateur circuitry?
Op-amp circuits are used as low-pass filters at the output of transmitters
Op-amp circuits are used as audio filters for receivers
Op-amp circuits are used as filters for smoothing power supply output
Op-amp circuits are used as high-pass filters to block RFI at the input of receivers

A-002-08-09 (1)
What is an inverting op-amp circuit?
An operational amplifier circuit connected such that the input and output signals are 180 degrees out of phase
An operational amplifier circuit connected such that the input and output signals are in phase
An operational amplifier circuit connected such that the input and output signals are 90 degrees out of phase
An operational amplifier circuit connected such that the input impedance is held to zero, while the output impedance is high

A-002-08-10 (2)
What is a non-inverting op-amp circuit?
An operational amplifier circuit connected such that the input and output signals are 90 degrees out of phase
An operational amplifier circuit connected such that the input and output signals are in phase
An operational amplifier circuit connected such that the input impedance is held low, and the output impedance is high
An operational amplifier circuit connected such that the input and output signals are 180 degrees out of phase

A-002-08-11 (2)
What term is most appropriate for a high gain, direct-coupled differential amplifier whose characteristics are determined by components mounted externally?
Difference amplifier
Operational amplifier
High gain audio amplifier
Summing amplifier

A-002-09-01 (3)
What is the mixing process?
The elimination of noise in a wideband receiver by phase differentiation
The recovery of intelligence from a modulated signal
The combination of two signals to produce sum and difference frequencies
The elimination of noise in a wideband receiver by phase comparison

A-002-09-02 (1)
What are the principal frequencies that appear at the output of a mixer circuit?
The original frequencies and the sum and difference frequencies
1.414 and 0.707 times the input frequencies
The sum, difference and square root of the input frequencies
Two and four times the original frequency

A-002-09-03 (2)
What occurs when an excessive amount of signal energy reaches the mixer circuit?
Automatic limiting occurs
Spurious signals are generated
A beat frequency is generated
Mixer blanking occurs

A-002-09-04 (1)
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 DC blocking capacitor
part of the input tuned circuit
a by-pass for the circuit
part of the output tank circuit

A-002-09-05 (4)
A frequency multiplier circuit must be operated in:
class AB
class B
class A
class C

A-002-09-06 (1)
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:
tune L1 to the desired harmonic
by-pass RF
tune L1 to the frequency applied to the base
provide positive feedback

A-002-09-07 (3)
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:
form a pi filter with L1 and C2
resonate with L1
keep RF out of the power supply
by-pass any audio components

A-002-09-08 (2)
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:
frequency divider
frequency multiplier
voltage divider
voltage doubler

A-002-09-09 (1)
In a circuit where the components are tuned to resonate at a higher frequency than applied, the circuit is most likely a:
a frequency multiplier
a VHF/UHF amplifier
a linear amplifier
a frequency divider

A-002-09-10 (3)
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:
DC blocking capacitor
tuning capacitor
RF by-pass capacitor
coupling capacitor

A-002-09-11 (3)
What stage in a transmitter would change a 5.3-MHz input signal to 14.3 MHz?
A linear translator
A frequency multiplier
A mixer
A beat frequency oscillator

A-002-10-01 (2)
What is a NAND gate?
A circuit that produces a logic "1" at its output only when all inputs are logic "1"
A circuit that produces a logic "0" at its output only when all inputs are logic "1"
A circuit that produces a logic "0" at its output if some but not all of its inputs are logic "1"
A circuit that produces a logic "0" at its output only when all inputs are logic "0"

A-002-10-02 (2)
What is an OR gate?
A circuit that produces a logic "0" at its output if all inputs are logic "1"
A circuit that produces a logic "1" at its output if any input is logic "1"
A circuit that produces logic "1" at its output if all inputs are logic "0"
A circuit that produces a logic "0" at its output if any input is logic "1"

A-002-10-03 (4)
What is a NOR gate?
A circuit that produces a logic "0" at its output only if all inputs are logic "0"
A circuit that produces a logic "1" at its output only if all inputs are logic "1"
A circuit that produces a logic "1" at its output if some but not all of its inputs are logic "1"
A circuit that produces a logic "0" at its output if any or all inputs are logic "1"

A-002-10-04 (4)
What is an INVERT gate?
A circuit that does not allow data transmission when its input is high
A circuit that allows data transmission only when its input is high
A circuit that produces a logic "1" at its output when the input is logic "1"
A circuit that produces a logic "0" at its output when the input is logic "1"

A-002-10-05 (4)
What is an EXCLUSIVE OR gate?
A circuit that produces a logic "0" at its output when only one of the inputs is logic "1"
A circuit that produces a logic "1" at its output when all of the inputs are logic "1"
A circuit that produces a logic "1" at its output when all of the inputs are logic "0"
A circuit that produces a logic "1" at its output when only one of the inputs is logic "1"

A-002-10-06 (1)
What is an EXCLUSIVE NOR gate?
A circuit that produces a logic "1" at its output when all of the inputs are logic "1"
A circuit that produces a logic "1" at its output when only one of the inputs is logic "0"
A circuit that produces a logic "1" at its output when only one of the inputs are logic "1"
A circuit that produces a logic "0" at its output when all of the inputs are logic "1"

A-002-10-07 (4)
What is an AND gate?
A circuit that produces a if all its inputs are logic logic "0" at its output only "1"
A circuit that produces a logic "1" at its output only if one of its inputs is logic "1"
A circuit that produces a logic "1" at its output if all inputs are logic "0"
A circuit that produces a logic "1" at its output only if all its inputs are logic "1"

A-002-10-08 (2)
What is a flip-flop circuit?
A binary sequential logic element with eight stable states
A binary sequential logic element with two stable states
A binary sequential logic element with four stable states
A binary sequential logic element with one stable state

A-002-10-09 (1)
What is a bistable multivibrator?
A flip-flop
An OR gate
An AND gate
A clock

A-002-10-10 (3)
What type of digital logic is also known as a latch?
A decade counter
An OR gate
A flip-flop
An op-amp

A-002-10-11 (3)
In a multivibrator circuit, when one transistor conducts, the other is:
amplified
reverse-biased
cut off
forward-biased

A-002-11-01 (3)
What is a crystal lattice filter?
A filter with wide bandwidth and shallow skirts made using quartz crystals
An audio filter made with four quartz crystals that resonate at 1 kHz intervals
A filter with narrow bandwidth and steep skirts made using quartz crystals
A power supply filter made with interlaced quartz crystals

A-002-11-02 (1)
What factor determines the bandwidth and response shape of a crystal lattice filter?
The relative frequencies of the individual crystals
The centre frequency chosen for the filter
The gain of the RF stage following the filter
The amplitude of the signals passing through the filter

A-002-11-03 (3)
For single-sideband phone emissions, what would be the bandwidth of a good crystal lattice filter?
15 kHz
500 Hz
2.1 kHz
6 kHz

A-002-11-04 (4)
The main advantage of a crystal oscillator over a tuned LC oscillator is:
longer life under severe operating use
freedom from harmonic emissions
simplicity
much greater frequency stability

A-002-11-05 (4)
A quartz crystal filter is superior to an LC filter for narrow bandpass applications because of the:
crystal's low Q
LC circuit's high Q
crystal's simplicity
crystal's high Q

A-002-11-06 (3)
Piezoelectricity is generated by:
touching crystals with magnets
adding impurities to a crystal
deforming certain crystals
moving a magnet near a crystal

A-002-11-07 (1)
Electrically, what does a crystal look like?
A very high Q tuned circuit
A very low Q tuned circuit
A variable capacitance
A variable tuned circuit

A-002-11-08 (4)
Crystals are sometimes used in a circuit which has an output an integral multiple of the crystal frequency. This circuit is called:
a crystal multiplier
a crystal lattice
a crystal ladder
an overtone oscillator

A-002-11-09 (1)
Which of the following properties DOES NOT apply to a crystal when used in an oscillator circuit?
High power output
Good frequency stability
Very low noise because of high Q
Good frequency accuracy

A-002-11-10 (1)
Crystal oscillators, filters and microphones depend upon which principle?
Piezoelectric effect
Hertzberg effect
Ferro-resonance
Overtone effect

A-002-11-11 (1)
Crystals are NOT applicable to which of the following?
Active filters
Microphones
Lattice filters
Oscillators

A-002-12-01 (3)
What are the three general groupings of filters?
Hartley, Colpitts and Pierce
Audio, radio and capacitive
High-pass, low-pass and band-pass
Inductive, capacitive and resistive

A-002-12-02 (3)
What are the distinguishing features of a Butterworth filter?
The product of its series and shunt-element impedances is a constant for all frequencies
It only requires conductors
It has a maximally flat response over its pass-band
It only requires capacitors

A-002-12-03 (3)
Which filter type is decribed as having ripple in the passband and a sharp cutoff?
An active LC filter
A passive op-amp filter
A Chebyshev filter
A Butterworth filter

A-002-12-04 (2)
What are the distinguishing features of a Chebyshev filter?
It requires only inductors
It allows ripple in the passband in return for steeper skirts
It requires only capacitors
It has a maximally flat response in the passband

A-002-12-05 (3)
Resonant cavities are used by amateurs as a:
power line filter
low pass-filter below 30 MHz
narrow bandpass filter at VHF and higher frequencies
high pass-filter above 30 MHz

A-002-12-06 (1)
On VHF and above, 1/4 wavelength coaxial cavities are used to give protection from high-level signals. For a frequency of approximatively 50 MHz, the diameter of such a device would be about four inches (10 cm). What would be its approximate length?
1.5 metres (5 ft)
0.6 metres (2 ft)
2.4 metres (8 ft)
3.7 metres (12 ft)

A-002-12-07 (1)
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:
helical resonator
diplexer
directional coupler
duplexer

A-002-12-08 (4)
Where you require bandwidth at VHF and higher frequencies about equal to a television channel, a good choice of filter is the:
resonant cavity
Butterworth
Chebyshev
None of the above

A-002-12-09 (4)
What is the primary advantage of the Butterworth filter over the Chebyshev filter?
It allows ripple in the passband in return for steeper skirts
It requires only inductors
It requires only capacitors
It has maximally flat response over its passband

A-002-12-10 (3)
What is the primary advantage of the Chebyshev filter over the Butterworth filter?
It requires only capacitors
It requires only inductors
It allows ripple in the passband in return for steeper skirts
It has maximally flat response over the passband

A-002-12-11 (3)
Which of the following filter types IS NOT suitable for use at audio and low radio frequencies?
Elliptical
Chebyshev
Cavity
Butterworth

A-003-01-01 (1)
What is the easiest amplitude dimension to measure by viewing a pure sine wave on an oscilloscope?
Peak-to-peak voltage
Peak voltage
RMS voltage
Average voltage

A-003-01-02 (4)
What is the RMS value of a 340 volt peak-to-peak pure sine wave?
170 volts
240 volts
300 volts
120 volts

A-003-01-03 (2)
What is the equivalent to the RMS value of an AC voltage?
The AC voltage found by taking the square of the average value of the peak AC voltage
The AC voltage causing the same heating of a given resistor as a DC voltage of the same value
The DC voltage causing the same heating of a given resistor as the peak AC voltage
The AC voltage found by taking the square root of the average AC value

A-003-01-04 (4)
If the peak value of a 100 Hz sinusoidal waveform is 20 volts, the RMS value is:
28.28 volts
7.07 volts
16.38 volts
14.14 volts

A-003-01-05 (4)
In applying Ohm's law to AC circuits, current and voltage values are:
average values
average values times 1.414
none of the proposed answers
peak values times 0.707

A-003-01-06 (2)
The effective value of a sine wave of voltage or current is:
50% of the maximum value
70.7% of the maximum value
100% of the maximum value
63.6% of the maximum value

A-003-01-07 (3)
AC voltmeter scales are usually calibrated to read:
peak voltage
instantaneous voltage
RMS voltage
average voltage

A-003-01-08 (3)
An AC voltmeter is calibrated to read the:
peak-to-peak value
average value
effective value
peak value

A-003-01-09 (2)
Which AC voltage value will produce the same amount of heat as a DC voltage, when applied to the same resistance?
The average value
The RMS value
The peak value
The peak-to-peak value

A-003-01-10 (4)
What is the peak-to-peak voltage of a sine wave that has an RMS voltage of 120 volts?
84.8 volts
169.7 volts
204.8 volts
339.5 volts

A-003-01-11 (2)
A sine wave of 17 volts peak is equivalent to how many volts RMS?
24 volts
12 volts
34 volts
8.5 volts

A-003-02-01 (1)
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:
peak-envelope power
mean power
carrier power
full power

A-003-02-02 (3)
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?
PIV
ERP
PEP
power factor

A-003-02-03 (1)
Peak-Envelope Power (PEP) for SSB transmission is:
Peak-Envelope Voltage (PEV) multiplied by 0.707, squared and divided by the load resistance
peak-voltage multiplied by peak current
equal to the rms power
a hypothetical measurement

A-003-02-04 (2)
The formula to be used to calculate the power output of a transmitter into a resistor load using a voltmeter is:
P = EI/R
P = E^2/R
P = EI cos 0
P = IR

A-003-02-05 (1)
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? PEP = Peak-Envelope Power PEV = Peak-Envelope Voltage Vp = peak-voltage RL = load resistance

PEP = [(0.707 PEV)(0.707 PEV)] / RL
PEP = [(Vp)(Vp)] / (RL)
PEP = (Vp)(Vp)(RL)
PEP = [(1.414 PEV)(1.414 PEV)] / RL

A-003-02-06 (2)
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?
400 watts
100 watts
1000 watts
200 watts

A-003-02-07 (2)
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?
1250 watts
625 watts
2500 watts
500 watts

A-003-02-08 (3)
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?
2120 watts
1500 watts
1060 watts
530 watts

A-003-02-09 (1)
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?
400 watts
200 watts
600 watts
1000 watts

A-003-02-10 (2)
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?
800 watts
1600 watts
6400 watts
3200 watts

A-003-02-11 (4)
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?
427.5 watts
884 watts
442 watts
625 watts

A-003-03-01 (3)
What is a dip meter?
An SWR meter
A marker generator
A variable frequency oscillator with metered feedback current
A field-strength meter

A-003-03-02 (4)
What does a dip meter do?
It measures transmitter output power accurately
It measures field strength accurately
It measures frequency accurately
It gives an indication of the resonant frequency of a circuit

A-003-03-03 (1)
What two ways could a dip meter be used in an amateur station?
To measure resonant frequencies of antenna traps and to measure a tuned circuit resonant frequency
To measure antenna resonance and impedance
To measure antenna resonance and percentage modulation
To measure resonant frequency of antenna traps and percentage modulation

A-003-03-04 (1)
A dip meter supplies the radio frequency energy which enables you to check:
the resonant frequency of a circuit
the calibration of an absorption-type wavemeter
the impedance mismatch in a circuit
the adjustment of an inductor

A-003-03-05 (1)
A dip meter may not be used to:
measure the value of capacitance or inductance
align transmitter-tuned circuits
determine the frequency of oscillations
align receiver-tuned circuits

A-003-03-06 (4)
The dial calibration on the output attenuator of a signal generator:
always reads the true output of the signal generator
reads twice the true output when the attenuator is properly terminated
reads half the true output when the attenuator is properly terminated
reads accurately only when the attenuator is properly terminated

A-003-03-07 (2)
What is a signal generator?
A low-stability oscillator which sweeps through a range of frequencies
A high-stability oscillator which can produce a wide range of frequencies and amplitudes
A low-stabilty oscillator used to inject a signal into a circuit under test
A high-stability oscillator which generates reference signals at exact frequency intervals

A-003-03-08 (4)
A dip meter:
should be tightly coupled to the circuit under test
may be used only with series tuned circuits
accurately measures frequencies
should be loosely coupled to the circuit under test

A-003-03-09 (4)
A dip meter is:
an SWR meter
an RF amplifier tuning meter
a battery electrolyte level gauge
a variable frequency oscillator with metered feedback current

A-003-03-10 (3)
The dip meter is most directly applicable to:
operational amplifier circuits
digital logic circuits
parallel tuned circuits
series tuned circuits

A-003-03-11 (4)
Which of the following IS NOT a factor affecting the frequency accuracy of a dip meter?
hand capacity
stray capacity
over coupling
transmitter power output

A-003-04-01 (2)
What does a frequency counter do?
It measures frequency deviation
It makes frequency measurements
It generates broad-band white noise for calibration
It produces a reference frequency

A-003-04-02 (4)
What factors limit the accuracy, frequency response and stability of a frequency counter?
Time base accuracy, temperature coefficient of the logic and time base stability
Number of digits in the readout, speed of the logic, and time base stability
Number of digits in the readout, external frequency reference and temperature coefficient of the logic
Time base accuracy, speed of the logic, and time base stability

A-003-04-03 (4)
How can the accuracy of a frequency counter be improved?
By using slower digital logic
By using faster digital logic
By improving the accuracy of the frequency response
By increasing the accuracy of the time base

A-003-04-04 (4)
If a frequency counter with a time base accuracy of +/- 0.1 PPM reads 146 520 000 Hz, what is the most that the actual frequency being measured could differ from that reading? "PPM = parts per million"
0.1 MHz
1.4652 Hz
1.4652 kHz
14.652 Hz

A-003-04-05 (1)
If a frequency counter, with a time base accuracy of 10 PPM reads 146 520 000 Hz, what is the most the actual frequency being measured could differ from that reading? "PPM = parts per million"
1465.2 Hz
146.52 Hz
146.52 kHz
1465.2 kHz

A-003-04-06 (1)
The clock in a frequency counter normally uses a:
crystal oscillator
self-oscillating Hartley oscillator
mechanical tuning fork
free-running multivibrator

A-003-04-07 (3)
The frequency accuracy of a frequency counter is determined by:
the size of the frequency counter
type of display used in the counter
the characteristics of the internal time-base generator
the number of digits displayed

A-003-05-01 (2)
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 rectangular pattern 100 mm wide and 150 mm high
A looping pattern with 3 horizontal loops, and 2 vertical loops
An oval pattern 100 mm wide and 150 mm high
A looping pattern with 100 horizontal loops and 150 vertical loops

A-003-05-02 (2)
What factors limit the accuracy, frequency response and stability of an oscilloscope?
Deflection amplifier output impedance and tube face frequency increments
Accuracy of the time base and the linearity and bandwidth of the deflection amplifiers
Accuracy and linearity of the time base and tube face voltage increments
Tube face voltage increments and deflection amplifier voltages

A-003-05-03 (2)
How can the frequency response of an oscilloscope be improved?
By using a crystal oscillator as the time base and increasing the vertical sweep rate
By increasing the horizontal sweep rate and the vertical amplifier frequency response
By increasing the vertical sweep rate and the horizontal amplifier frequency response
By using triggered sweep and a crystal oscillator for the timebase

A-003-05-04 (3)
You can use an oscilloscope to display the input and output of a circuit at the same time by:
measuring the input on the X axis and the output on the Y axis
measuring the input on the X axis and the output on the Z axis
utilizing a dual trace oscilloscope
measuring the input on the Y axis and the output on the X axis

A-003-05-05 (3)
An oscilloscope cannot be used to:
measure frequency
measure DC voltage
determine FM carrier deviation
determine the amplitude of complex voltage wave forms

A-003-05-06 (3)
The bandwidth of an oscilloscope is:
directly related to gain compression
indirectly related to screen persistence
the highest frequency signal the scope can display
a function of the time-base accuracy

A-003-05-07 (3)
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 horizontal straight line
an ellipse
a diagonal straight line
a circle

A-003-05-08 (3)
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:
20 kHz
50 kHz
40 kHz
30 kHz

A-003-05-09 (2)
What item of test equipment contains horizontal and vertical channel amplifiers?
A signal generator
An oscilloscope
An ammeter
An ohmmeter

A-003-05-10 (2)
What is the best instrument to use to check the signal quality of a CW or single-sideband phone transmitter?
A sidetone monitor
An oscilloscope
A signal tracer and an audio amplifier
A field-strength meter

A-003-05-11 (1)
What signal source is connected to the vertical input of an oscilloscope when checking the quality of a transmitted signal?
the RF signals of a nearby receiving antenna
the IF output of a monitoring receiver
the audio input of the transmitter
the RF output of the transmitter

A-003-06-01 (3)
A meter has a full-scale deflection of 40 microamps 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:
24 ohms
16 ohms
4 ohms
40 ohms

A-003-06-02 (2)
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:
series resistance of 1 999.5 ohms
series resistance of 19 999.5 ohms
shunt resistance of 19 999.5 ohms
shunt resistance of 19.5 ohms

A-003-06-03 (4)
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:
1 500 ohms
750 000 ohms
1 200 000 ohms
600 000 ohms

A-003-06-04 (1)
The sensitivity of an ammeter is an expression of:
the amount of current causing full-scale deflection
the resistance of the meter
the loading effect the meter will have on a circuit
the value of the shunt resistor

A-003-06-05 (1)
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:
50 microampere meter
1 milliampere meter
50 milliampere meter
100 milliampere meter

A-003-06-06 (2)
The sensitivity of a voltmeter, whose resistance is 150 000 ohms on the 150-volt range, is:
100 000 ohms per volt
1000 ohms per volt
10 000 ohms per volt
150 ohms per volt

A-003-06-07 (3)
The range of a DC ammeter can easily be extended by:
connecting an external resistance in series with the internal resistance
changing the internal inductance of the meter
connecting an external resistance in parallel with the internal resistance
changing the internal capacitance of the meter to resonance

A-003-06-08 (2)
What happens inside a multimeter when you switch it from a lower to a higher voltage range?
Resistance is reduced in series with the meter
Resistance is added in series with the meter
Resistance is reduced in parallel with the meter
Resistance is added in parallel with the meter

A-003-06-09 (1)
How can the range of an ammeter be increased?
By adding resistance in parallel with the meter
By adding resistance in series with the circuit under test
By adding resistance in parallel with the circuit under test
By adding resistance in series with the meter

A-003-06-10 (2)
Where should an RF wattmeter be connected for the most accurate readings of transmitter output power?
One-half wavelength from the transmitter output
At the transmitter output connector
One-half wavelength from the antenna feed point
At the antenna feed point

A-003-06-11 (4)
At what line impedance do most RF wattmeters usually operate?
25 ohms
100 ohms
300 ohms
50 ohms

A-004-01-01 (3)
For the same transformer secondary voltage, which rectifier has the highest average output voltage?
Half-wave
Quarter-wave
Bridge
Full-wave

A-004-01-02 (2)
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.
0.45
2.8
5.6
1.4

A-004-01-03 (2)
In a full-wave centre-tap power supply, regardless of load conditions, the peak inverse voltage (PIV) will be _____ times the RMS voltage:
0.636
2.8
0.707
1.4

A-004-01-04 (3)
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:
any output filtering
a centre-tapped primary on the transformer
a centre-tapped secondary on the transformer
diodes across each leg of the transformer

A-004-01-05 (3)
The output from a full-wave bridge rectifier circuit will appear to be:
double that of the full-wave centre-tap rectifier
half that of the full-wave centre-tap rectifier
the same as the full-wave centre-tap rectifier
the same as the half-wave rectifier

A-004-01-06 (1)
The ripple frequency produced by a full-wave power supply connected to a normal household circuit is:
120 Hz
60 Hz
90 Hz
30 Hz

A-004-01-07 (2)
The ripple frequency produced by a half-wave power supply connected to a normal household circuit is:
90 Hz
60 Hz
120 Hz
30 Hz

A-004-01-08 (3)
Full-wave voltage doublers:
create four times the half- wave voltage output
use less power than half- wave doublers
use both halves of an AC wave
are used only in high-frequency power supplies

A-004-01-09 (4)
What are the two major ratings that must not be exceeded for silicon-diode rectifiers used in power-supply circuits?
Average power; average voltage
Capacitive reactance; avalanche voltage
Peak load impedance; peak voltage
Peak inverse voltage; average forward current

A-004-01-10 (2)
Why should a resistor and capacitor be wired in parallel with power-supply rectifier diodes?
To smooth the output waveform
To equalize voltage drops and guard against transient voltage spikes
To decrease the output voltage
To ensure that the current through each diode is about the same

A-004-01-11 (3)
What is the output waveform of an unfiltered full-wave rectifier connected to a resistive load?
A steady DC voltage
A sine wave at half the frequency of the AC input
A series of pulses at twice the frequency of the AC input
A series of pulses at the same frequency as the AC input

A-004-02-01 (4)
Filter chokes are rated according to:
reactance at 1000 Hz
power loss
breakdown voltage
inductance and current-handling capacity

A-004-02-02 (3)
Which of the following circuits gives the best regulation, under similar load conditions?
A half-wave bridge rectifier with a capacitor input filter
A half-wave rectifier with a choke input filter
A full-wave rectifier with a choke input filter
A full-wave rectifier with a capacitor input filter

A-004-02-03 (4)
The advantage of the capacitor input filter over the choke input filter is:
better filtering action or smaller ripple voltage
improved voltage regulation
lower peak rectifier currents
a higher terminal voltage output

A-004-02-04 (1)
With a normal load, the choke input filter will give the:
best regulated output
greatest percentage of ripple
greatest ripple frequency
highest output voltage

A-004-02-05 (2)
There are two types of filters in general use in a power supply. They are called:
choke output and capacitor output
choke input and capacitor input
choke input and capacitor output
choke output and capacitor input

A-004-02-06 (1)
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:
improve voltage regulation
provide a ground return for the transformer
inhibit the flow of current through the supply
act as a secondary smoothing device in conjunction with the filter

A-004-02-07 (1)
In a power supply, series chokes will:
readily pass the DC but will impede the flow of the AC component
readily pass the DC and the AC component
impede the passage of DC but will pass the AC component
impede both DC and AC

A-004-02-08 (4)
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:
utilizing a full-wave bridge rectifier circuit
placing an ammeter in the output circuit
increasing the value of the output capacitor
adjusting the bleeder resistance

A-004-02-09 (3)
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:
the bleeder resistor and the first choke
first capacitor and second capacitor
first choke and first capacitor
first choke and second capacitor

A-004-02-10 (3)
Excessive rectifier peak current and abnormally high peak inverse voltages can be caused in a power supply by the filter forming a:
short circuit across the bleeder
parallel resonant circuit with the first choke and second capacitor
series resonant circuit with the first choke and first capacitor
tuned inductance in the filter choke

A-004-02-11 (3)
In a properly designed choke input filter power supply, the filter capacitor will be about nine-tenths of the AC RMS no-load voltage across the voltage; yet it is advisable to use capacitors rated at the peak transformer voltage. Why is this large safety margin suggested?
Resonance can be set up in the filter producing high voltages
Under heavy load, high currents and voltages are produced
Under no-load conditions and a burned-out bleeder, voltages could reach the peak transformer voltage
Under no-load conditions, the current could reach a high level

A-004-03-01 (1)
What is one characteristic of a linear electronic voltage regulator?
The conduction of a control element is varied in direct proportion to the line voltage or load current
It has a ramp voltage at its output
A pass transistor switches from its "on" state to its "off" state
The control device is switched on or off, with the duty cycle proportional to the line or load conditions

A-004-03-02 (1)
What is one characteristic of a switching voltage regulator?
The control device is switched on and off, with the duty cycle proportional to the line or load conditions
The conduction of a control element is varied in direct proportion to the line voltage or load current
It provides more than one output voltage
It gives a ramp voltage at its output

A-004-03-03 (4)
What device is typically used as a stable reference voltage in a linear voltage regulator?
An SCR
A varactor diode
A junction diode
A zener diode

A-004-03-04 (4)
What type of linear regulator is used in applications requiring efficient utilization of the primary power source?
A shunt regulator
A constant current source
A shunt current source
A series regulator

A-004-03-05 (3)
What type of linear voltage regulator is used in applications requiring a constant load on the unregulated voltage source?
A constant current source
A shunt current source
A shunt regulator
A series regulator

A-004-03-06 (3)
How is remote sensing accomplished in a linear voltage regulator?
An error amplifier compares the input voltage to the reference voltage
A load connection is made outside the feedback loop
A feedback connection to an error amplifier is made directly to the load
By wireless inductive loops

A-004-03-07 (2)
What is a three-terminal regulator?
A regulator that supplies three voltages at a constant current
A regulator containing a voltage reference, error amplifier, sensing resistors and transistors, and a pass element
A regulator containing three error amplifiers and sensing transistors
A regulator that supplies three voltages with variable current

A-004-03-08 (2)
What are the important characteristics of a three-terminal regulator?
Maximum and minimum input voltage, minimum output current and maximum output voltage
Maximum and minimum input voltage, maximum output current and voltage
Maximum and minimum input voltage, minimum output voltage and maximum output current
Maximum and minimum input voltage, minimum output current and voltage

A-004-03-09 (2)
What type of voltage regulator contains a voltage reference, error amplifier, sensing resistors and transistors, and a pass element in one package?
An op-amp regulator
A three-terminal regulator
A switching regulator
A zener regulator

A-004-03-10 (1)
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:
linear and switching
non-linear and switching
linear and non-linear
"stiff" and switching

A-004-03-11 (2)
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:
nine-pin terminal regulator
three-terminal regulator
twenty-four pin terminal regulator
six-terminal regulator

A-004-04-01 (2)
In a series-regulated power supply, the power dissipation of the pass transistor is:
the inverse of the load current and the input/output voltage differential
directly proportional to the load current and the input/output voltage differential
dependent upon the peak inverse voltage appearing across the Zener diode
indirectly proportional to the load voltage and the input/output voltage differential

A-004-04-02 (1)
In any regulated power supply, the output is cleanest and the regulation is best:
at the point where the sampling network or error amplifier is connected
across the secondary of the pass transistor
across the load
at the output of the pass transistor

A-004-04-03 (1)
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:
load
ideal
rectifier
differential

A-004-04-04 (3)
The regulation of long-term changes in the load resistance of a power supply is called:
active regulation
analog regulation
static regulation
dynamic regulation

A-004-04-05 (1)
The regulation of short-term changes in the load resistance of a power supply is called:
dynamic regulation
static regulation
analog regulation
active regulation

A-004-04-06 (3)
The dynamic regulation of a power supply is improved by increasing the value of :
the choke
the input capacitor
the output capacitor
the bleeder resistor

A-004-04-07 (4)
The output capacitor, in a power supply filter used to provide power for an SSB or CW transmitter, will give better dynamic regulation if:
the negative terminal of the electrolytic is connected to the positive and the positive terminal to ground
a battery is placed in series with the output capacitor
it is placed in series with other capacitors
the output capacitance is increased

A-004-04-08 (3)
In a regulated power supply, four diodes connected together in a BRIDGE act as:
equalization across the transformer
matching between the secondary of the power transformer and the filter
a rectifier
a tuning network

A-004-04-09 (3)
In a regulated power supply, components that conduct alternating current at the input before the transformer and direct current before the output are:
capacitors
diodes
fuses
chokes

A-004-04-10 (1)
In a regulated power supply, the output of the electrolytic filter capacitor is connected to the :
voltage regulator
pi filter
solid-state by-pass circuit
matching circuit for the load

A-004-04-11 (4)
In a regulated power supply, a diode connected across the input and output terminals of a regulator is used to:
provide an RF by-pass for the voltage control
provide additional capacity
protect the regulator from voltage fluctuations in the primary of the transformer
protect the regulator

A-005-01-01 (1)
How is the positive feedback coupled to the input in a Hartley oscillator?
Through a tapped coil
Through a capacitive divider
Through link coupling
Through a neutralizing capacitor

A-005-01-02 (4)
How is positive feedback coupled to the input in a Colpitts oscillator?
Through a tapped coil
Through a neutralizing capacitor
Through a link coupling
Through a capacitive divider

A-005-01-03 (3)
How is positive feedback coupled to the input in a Pierce oscillator?
Through a neutralizing capacitor
Through link coupling
Through capacitive coupling
Through a tapped coil

A-005-01-04 (2)
Why is the Colpitts oscillator circuit commonly used in a VFO?
It can be used with or without crystal lock-in
It is stable
The frequency is a linear function with load impedance
It has high output power

A-005-01-05 (2)
Why must a very stable reference oscillator be used as part of a phase-locked loop (PLL) frequency synthesizer?
Any phase variations in the reference oscillator signal will produce harmonic distortion in the modulating signal
Any phase variations in the reference oscillator signal will produce phase noise in the synthesizer output
Any amplitude variations in the reference oscillator signal will prevent the loop from changing frequency
Any amplitude variations in the reference oscillator signal will prevent the loop from locking to the desired signal

A-005-01-06 (4)
Positive feedback from a capacitive divider indicates the oscillator type is:
Pierce
Hartley
Miller
Colpitts

A-005-01-07 (4)
In an oscillator circuit designed for high stability, the positive feedback is drawn from two capacitors connected in series. These two capacitors would most likely be:
ceramic
electrolytics
mylar
silver mica

A-005-01-08 (4)
In an oscillator circuit where positive feedback is obtained through a single capacitor in series with the crystal, the type of oscillator is:
Colpitts
Hartley
Miller
Pierce

A-005-01-09 (3)
A circuit depending on positive feedback for its operation would be a:
mixer
detector
variable-frequency oscillator
audio amplifier

A-005-01-10 (1)
An apparatus with an oscillator and a class C amplifier would be:
a two-stage CW transmitter
a fixed-frequency single- sideband transmitter
a two-stage frequency- modulated transmitter
a two-stage regenerative receiver

A-005-01-11 (4)
In an oscillator where positive feedback is provided through a capacitor in series with a crystal, that type of oscillator is a:
Colpitts
Hartley
Franklin
Pierce

A-005-02-01 (2)
The output tuning controls on a transmitter power amplifier:
allow switching to different antennas
allow efficient transfer of power to the antenna
reduce the possibility of cross-modulation in adjunct receivers
are involved with frequency multiplication in the previous stage

A-005-02-02 (1)
The purpose of using a centre-tap return connection on the secondary of transmitting tube's filament transformer is to:
prevent modulation of the emitted wave by the alternating current filament supply
reduce the possibility of harmonic emissions
keep the output voltage constant with a varying load
obtain optimum power output

A-005-02-03 (1)
In a grounded grid amplifier using a triode vacuum tube, the input signal is applied to:
the cathode
the plate
the control grid
the filaments

A-005-02-04 (4)
In a grounded grid amplifier using a triode vacuum tube, the plate is connected to the pi-network through a:
by-pass capacitor
tuning capacitor
electrolytic capacitor
blocking capacitor

A-005-02-05 (2)
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:
filament voltage
B+ (high voltage)
ground
B- (bias)

A-005-02-06 (3)
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:
ground
filament voltage
B- (bias)
B+ (high voltage)

A-005-02-07 (4)
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:
B- (bias)
B+ (high voltage)
Screen voltage
filament voltage

A-005-02-08 (2)
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?
500 volts
2000 volts
3000 volts
1000 volts

A-005-02-09 (2)
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:
tuning capacitors
by-pass capacitors
electrolytic capacitors
blocking capacitors

A-005-02-10 (2)
After you have opened a VHF power amplifier to make internal tuning adjustments, what should you do before you turn the amplifier on?
Make sure that the power interlock switch is bypassed so you can test the amplifier
Be certain all amplifier shielding is fastened in place
Be certain no antenna is attached so that you will not cause any interference
Remove all amplifier shielding to ensure maximum cooling

A-005-02-11 (3)
Harmonics produced in an early stage of a transmitter may be reduced in a later stage by :
larger value coupling capacitors
greater input to the final stage
tuned circuit coupling between stages
transistors instead of tubes

A-005-03-01 (2)
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:
act as part of a pi filter
be part of a tuned circuit
provide the necessary feedback for oscillation
act as part of a balanced mixer

A-005-03-02 (2)
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:
provide negative feedback
form a low-pass filter
form a key-click filter
form a RF-tuned circuit

A-005-03-03 (3)
In a simple 2 stage CW transmitter, the transistor in the second stage would act as:
a frequency multiplier
the master oscillator
a power amplifier
an audio oscillator

A-005-03-04 (2)
An advantage of keying the buffer stage in a transmitter is that:
key clicks are eliminated
changes in oscillator frequency are less likely
the radiated bandwidth is restricted
high RF voltages are not present

A-005-03-05 (2)
As a power amplifier is tuned, what reading on its grid- current meter indicates the best neutralization?
Minimum grid current
A minimum change in grid current as the output circuit is changed
Maximum grid current
A maximum change in grid current as the output circuit is changed

A-005-03-06 (2)
What does a neutralizing circuit do in an RF amplifier?
It eliminates AC hum from the power supply
It cancels the effects of positive feedback
It reduces incidental grid modulation
It controls differential gain

A-005-03-07 (4)
What is the reason for neutralizing the final amplifier stage of a transmitter?
To limit the modulation index
To cut off the final amplifier during standby periods
To keep the carrier on frequency
To eliminate self-oscillations

A-005-03-08 (3)
Parasitic oscillations are usually generated due to:
harmonics from some earlier multiplier stage
excessive drive or excitation to the power amplifier
accidental resonant frequencies in the power amplifier
a mismatch between power amplifier and feedline

A-005-03-09 (4)
Parasitic oscillations would tend to occur mostly in:
high gain audio output stages
high voltage rectifiers
mixer stages
RF power output stages

A-005-03-10 (2)
Why is neutralization necessary for some vacuum-tube amplifiers?
To reduce grid-to-cathode leakage
To cancel oscillation caused by the effects of interelectrode capacitance
To cancel AC hum from the filament transformer
To reduce the limits of loaded Q

A-005-03-11 (3)
Parasitic oscillations in an RF power amplifier may be caused by:
overdriven stages
unintended tuned circuits
lack of neutralisation
excessive harmonic production

A-005-04-01 (2)
What type of signal does a balanced modulator produce?
FM with balanced deviation
Double sideband, suppressed carrier
Full carrier
Single sideband, suppressed carrier

A-005-04-02 (3)
How can a single-sideband phone signal be produced?
By driving a product detector with a DSB signal
By using a loop modulator followed by a mixer
By using a balanced modulator followed by a filter
By using a reactance modulator followed by a mixer

A-005-04-03 (2)
Carrier suppression in a single-sideband transmitter takes place in:
the carrier decouple stage
the balanced modulator stage
the mechanical filter
the frequency multiplier stage

A-005-04-04 (2)
Transmission with SSB, as compared to conventional AM transmission, results in:
6 dB gain in the receiver
6 dB gain in the transmitter and 3 dB gain in the receiver
a greater bandpass requirement in the receiver
3 db gain in the transmitter

A-005-04-05 (3)
The peak power output of a single-sideband transmitter, when being tested by a two-tone generator is:
equal to the RF peak output power of any of the tones
one-half of the RF peak output power of any of the tones
twice the RF power output of any of the tones
one-quarter of the RF peak output power of any of the tones

A-005-04-06 (2)
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?
An audio-frequency sine wave
Two audio-frequency sine waves
An audio-frequency square wave
Normal speech

A-005-04-07 (1)
When testing the amplitude linearity of a single-sideband microphone input and on what audio tones are fed into the transmitter, what kind of kind of instrument is the output observed?
Two non-harmonically related tones are fed in, and the output is observed on an oscilloscope
Two harmonically related tones are fed in, and the output is observed on an oscilloscope
Two harmonically related tones are fed in, and the output is observed on a distortion analyzer
Two non-harmonically related tones are fed in, and the output is observed on a distortion analyzer

A-005-04-08 (4)
What audio frequencies are used in a two-tone test of the linearity of a single-sideband phone transmitter?
20 Hz and 20 kHz tones must be used
1200 Hz and 2400 Hz tones must be used
Any two audio tones may be used, but they must be within the transmitter audio passband, and must be harmonically related
Any two audio tones may be used, but they must be within the transmitter audio passband, and should not be harmonically related

A-005-04-09 (3)
What measurement can be made of a single-sideband phone transmitter's amplifier by performing a two-tone test using an oscilloscope?
Its frequency deviation
Its percent of carrier phase shift
Its linearity
Its percent of frequency modulation

A-005-04-10 (1)
How much is the carrier suppressed below peak output power in a single-sideband phone transmission?
At least 40 dB
No more than 20 dB
No more than 30 dB
At least 60 dB

A-005-04-11 (1)
What is meant by flattopping in a single-sideband phone transmission?
Signal distortion caused by excessive drive
Signal distortion caused by insufficient collector current
The transmitter's automatic level control is properly adjusted
The transmitter's carrier is properly suppressed

A-005-05-01 (1)
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?
3
0.3
3000
1000

A-005-05-02 (3)
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?
0.333
2000
3
6000

A-005-05-03 (4)
What is the deviation ratio of an FM phone signal having a maximum frequency swing of plus or minus 5 kHz and accepting a maximum modulation rate of 3 kHz?
60
0.16
0.6
1.66

A-005-05-04 (2)
What is the deviation ratio of an FM phone signal having a maximum frequency swing of plus or minus 7.5 kHz and accepting a maximum modulation rate of 3.5 kHz?
0.47
2.14
47
0.214

A-005-05-05 (4)
When the transmitter is not modulated, or the amplitude of the modulating signal is zero, the frequency of the carrier is called its:
frequency deviation
frequency shift
modulating frequency
centre frequency

A-005-05-06 (1)
In a FM transmitter system, the number of cycles of deviation from the centre frequency is determined solely by the:
amplitude of the modulating frequency
frequency of the modulating frequency
amplitude and the frequency of the modulating frequency
modulating frequency and the amplitude of the centre frequency

A-005-05-07 (4)
Any FM wave with single-tone modulation has:
two sideband frequencies
four sideband frequencies
one sideband frequency
an infinite number of sideband frequencies

A-005-05-08 (3)
The deviation meter works on the principle of:
detecting the frequencies in the sidebands
the amplitude of power in the sidebands
a carrier null and multiplying the modulation frequency by the modulation index
a carrier peak and dividing by the modulation index

A-005-05-09 (1)
When using a deviation meter, it is important to know:
modulating frequency and the modulation index
modulation index
modulating frequency
pass-band of the IF filter

A-005-05-10 (3)
What is the total bandwidth of an FM-phone transmission having a 5-kHz deviation and a 3-kHz modulating frequency?
8 kHz
5 kHz
16 kHz
3 kHz

A-005-05-11 (3)
What is the frequency deviation for a 12.21-MHz reactance-modulated oscillator in a 5-kHz deviation, 146.52-MHz FM-phone transmitter?
12 kHz
5 kHz
416.7 Hz
41.67 Hz

A-005-06-01 (2)
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, what is this called?
Neutralization
Intermodulation interference
Adjacent channel interference
Amplifier desensitization

A-005-06-02 (3)
How does intermodulation interference between two repeater transmitters usually occur?
When the signals are reflected in phase by aircraft passing overhead
When they are in close proximity and the signals cause feedback in one or both of their final amplifiers
When they are in close proximity and the signals mix in one or both of their final amplifiers
When the signals are reflected out of phase by aircraft passing overhead

A-005-06-03 (3)
How can intermodulation interference between two repeater transmitters in close proximity often be reduced or eliminated?
By installing a low-pass filter in the antenna feed line
By installing a high-pass filter in the antenna feed line
By installing a terminated circulator or ferrite isolator in the feed line to the transmitter and duplexer
By using a Class C final amplifier with high driving power

A-005-06-04 (4)
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?
146.88 MHz and 146.34 MHz
146.01 MHz and 147.30 MHz
73.35 MHz and 239.40 MHz
146.34 MHz and 146.61 MHz

A-005-06-05 (1)
What type of circuit varies the tuning of an amplifier tank circuit to produce FM signals?
A phase modulator
A balanced modulator
A double balanced mixer
An audio modulator

A-005-06-06 (3)
What audio shaping network is added at an FM transmitter to attenuate the lower audio frequencies?
An audio prescaler
A heterodyne suppressor
A pre-emphasis network
A de-emphasis network

A-005-06-07 (2)
Which type of filter would be best to use in a 2-metre repeater duplexer?
A DSP filter
A cavity filter
An L-C filter
A crystal filter

A-005-06-08 (1)
The characteristic difference between a phase modulator and a frequency modulator is:
pre-emphasis
the centre frequency
de-emphasis
frequency inversion

A-005-06-09 (4)
In most modern FM transmitters, to produce a better sound, a compressor and a clipper are placed:
between the multiplier and the PA
between the modulator and the oscillator
in the microphone circuit, before the audio amplifier
between the audio amplifier and the modulator

A-005-06-10 (1)
Three important parameters to be verified in an FM transmitter are:
linearity, frequency deviation and frequency stability
distortion, bandwidth and sideband power
modulation, pre-emphasis and carrier suppression
frequency stability, de-emphasis and linearity

A-005-06-11 (2)
For a repeater to operate automatically, the circuit that determines when to turn the transmitter on and off is the:
limiter
carrier operated relay
automatic identifier
multiplier

A-005-07-01 (1)
Maintaining the peak RF output of a SSB transmitter at a relatively constant level requires a circuit called the:
automatic level control (ALC)
automatic gain control (AGC)
automatic output control (AOC)
automatic volume control (AVC)

A-005-07-02 (1)
Speech compression associated with SSB transmission implies:
full amplification of low level signals and reducing or eliminating amplification of high level signals
full amplification of high level signals and reducing or eliminating signals amplification of low level
a lower signal-to-noise ratio
circuit level instability

A-005-07-03 (1)
Which of the following functions IS NOT included in a typical digital signal processor?
Aliasing amplifier
Analog to digital converter
Digital to analog converter
Mathematical transform

A-005-07-04 (3)
How many bits are required to provide 256 discrete levels, or a ratio of 256:1?
6 bits
16 bits
8 bits
4 bits

A-005-07-05 (3)
Adding one bit to the word length, is equivalent to adding ____ dB to the dynamic range of the digitizer:
1 dB
4 dB
6 dB
3 dB

A-005-07-06 (3)
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?
Digital formatter
Mathematical transformer
Digital signal processor
Digital transformer

A-005-07-07 (2)
Which principle IS NOT associated with analog signal processing?
compression
frequency division
bandwidth limiting
clipping

A-005-07-08 (2)
Which of the following IS NOT a method used for peak limiting, in a signal processor?
RF clipping
frequency clipping
compression
AF clipping

A-005-07-09 (3)
What is the undesirable result of AF clipping in a speech processor?
Reduced average power
Increased average power
Increased harmonic distortion
Reduction in peak amplitude

A-005-07-10 (4)
Which description IS NOT correct? You are planning to build a speech processor for your transceiver. Compared to AF clipping, RF clipping:
has less distortion
is more expensive to implement
is more difficult to implement
is easier to implement

A-005-07-11 (1)
Automatic Level Control (ALC) is another name for:
RF compression
AF compression
RF clipping
AF clipping

A-005-08-01 (3)
What digital code consists of elements having unequal length?
AX.25
Baudot
Morse code
ASCII

A-005-08-02 (2)
The International Organization for Standardization has developed a seven-level reference model for a packet-radio communications structure. What level is responsible for the actual transmission of data and handshaking signals?
The link layer
The physical layer
The network layer
The transport layer

A-005-08-03 (1)
The International Organization for Standardization has developed a seven-layer reference model for a packet-radio communications structure. What level arranges the bits into frames and controls data flow?
The link layer
The synchronization layer
The communications layer
The transport layer

A-005-08-04 (1)
What is one advantage of using ASCII rather than Baudot code?
It is possible to transmit upper and lower case text
ASCII includes built-in error correction
ASCII characters contain fewer information bits
The larger character set allows store-and-forward

A-005-08-05 (3)
What type of error control system is used in AMTOR ARQ (Mode A)?
The receiving station checks the frame check sequence (FCS) against the transmitted FCS
Each character is sent twice
The receiving station automatically requests repeats when needed
Mode A AMTOR does not include an error control system

A-005-08-06 (4)
What error-correction system is used in AMTOR FEC (Mode B)?
Mode B AMTOR does not include an error-correction system
The receiving station automatically requests repeats when needed
The receiving station checks the frame check sequence (FCS) against the transmitted FCS
Each character is sent twice

A-005-08-07 (2)
What is the primary advantage of AMTOR over Baudot RTTY?
Surplus teletype machines that use AMTOR are readily available
AMTOR includes an error detection system
Photographs may be transmitted using AMTOR
AMTOR characters contain fewer information bits than Baudot characters

A-005-08-08 (2)
We have all used the term ASCII when using computers or teletypewriting equipment. What do those initials represent?
A Standard Code for Information Interchange
American Standard Code for Information Interchange
North American System Compatible with International Interchange
Amalgamated System Code for Information Interchange

A-005-08-09 (1)
The designator AX.25 is associated with which amateur radio mode?
packet
RTTY
ASCII
spread spectrum speech

A-005-08-10 (2)
How many information bits are included in the Baudot code?
7
5
8
6

A-005-08-11 (1)
How many information bits are included in the ASCII code?
8
7
6
5

A-005-09-01 (1)
What term describes a wide-band communications system in which the RF carrier varies according to some predetermined sequence?
Spread spectrum communication
Amplitude-compandored single sideband
AMTOR
Time domain frequency modulation

A-005-09-02 (4)
What is the term used to describe a spread spectrum communications system where the centre frequency of a conventional carrier is altered many times per second in accordance with a pseudo- random list of channels?
Direct sequence
Time-domain frequency modulation
Frequency compandored spread spectrum
Frequency hopping

A-005-09-03 (3)
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?
Frequency hopping
Phase compandored spread spectrum
Direct sequence
Binary phase-shift keying

A-005-09-04 (1)
Frequency hopping is used with which type of transmission?
Spread spectrum
AMTOR
Packet
RTTY

A-005-09-05 (1)
Direct sequence is used with which type of transmission?
Spread spectrum
AMTOR
Packet
RTTY

A-005-09-06 (3)
Which type of signal is used to produce a predetermined alteration in the carrier for spread spectrum communication?
Frequency-compandored sequence
Quantizing noise
Pseudo-random sequence
Random noise sequence

A-005-09-07 (4)
Why is it difficult to monitor a spread spectrum transmission?
It requires narrower bandwidth than most receivers have
It varies too quickly in amplitude
The signal is too distorted for comfortable listening
Your receiver must be frequency-synchronized to the transmitter

A-005-09-08 (3)
What is frequency hopping spread spectrum?
The carrier is amplitude-modulated over a wide range called the spread
The carrier is frequency-compandored
The carrier is altered in accordance with a pseudo-random list of channels
The carrier is phase-shifted by a fast binary bit stream

A-005-09-09 (3)
What is direct-sequence spread spectrum?
The carrier is amplitude modulated over a range called the spread
The carrier is frequency-compandored
The carrier is phase-shifted by a fast binary bit stream
The carrier is altered in accordance with a pseudo-random list of channels

A-005-09-10 (2)
Why are received spread-spectrum signals so resistant to interference?
The receiver is always equipped with a special digital signal processor (DSP) interference filter
Signals not using the spectrum-spreading algorithm are suppressed in the receiver
If interference is detected by the receiver, it will signal the transmitter to change frequencies
The high power used by a spread-spectrum transmitter keeps its signal from being easily overpowered

A-005-09-11 (1)
How does the spread-spectrum technique of frequency hopping (FH) work?
The frequency of an RF carrier is changed very rapidly according to a particular pseudo-random sequence
If interference is detected by the receiver, it will signal the transmitter to change frequency
If interference is detected by the receiver, it will signal the transmitter to wait until the frequency is clear
A pseudo-random bit stream is used to shift the phase of an RF carrier very rapidly in a particular sequence

A-006-01-01 (3)
What are the advantages of the frequency-conversion process in a superheterodyne receiver?
Automatic detection in the RF amplifier and increased sensitivity
Automatic soft-limiting and automatic squelching
Increased selectivity and optimal tuned circuit design
Automatic squelching and increased sensitivity

A-006-01-02 (1)
What factors should be considered when selecting an intermediate frequency?
Image rejection
Noise figure and distortion
Interference to other services
Cross-modulation distortion and interference

A-006-01-03 (3)
One of the greatest advantages of the double-conversion over the single-conversion receiver is that it:
is much more stable
is much more sensitive
suffers less from image interference
produces a louder signal at the output

A-006-01-04 (1)
In a communications receiver, a crystal filter would be located in the:
IF circuits
local oscillator
audio output stage
detector

A-006-01-05 (1)
A multiconversion superheterodyne receiver is more susceptible to spurious responses than a single-conversion receiver because of the:
additional oscillators and mixing frequencies involved in the design
poorer selectivity in the IF caused by the multitude of frequency changes
greater sensitivity introducing higher levels of RF to the receiver
AGC being forced to work harder causing the stages concerned to overload

A-006-01-06 (2)
Most superheterodyne receivers operating on the HF amateur bands through to 30 MHz use a standard intermediate frequency (IF) of:
200 kHz
455 kHz
500 kHz
355 kHz

A-006-01-07 (4)
Which stage of a receiver has its input and output circuits tuned to the received frequency?
The local oscillator
The audio frequency amplifier
The detector
The RF amplifier

A-006-01-08 (4)
Which stage of a superheterodyne receiver lies between a tuneable stage and a fixed tuned stage?
Radio frequency amplifier
Intermediate frequency amplifier
Local oscillator
Mixer

A-006-01-09 (4)
A single conversion receiver with a 9 MHz IF has a local oscillator operating at 16 MHz. The frequency it is tuned to is:
16 MHz
21 MHz
9 MHz
7 MHz

A-006-01-10 (2)
A double conversion receiver designed for SSB reception has a beat frequency oscillator and:
one IF stage and one local oscillator
two IF stages and two local oscillators
two IF stages and three local oscillators
two IF stages and one local oscillator

A-006-01-11 (2)
The advantage of a double conversion receiver over a single conversion receiver is that it:
does not drift off frequency
suffers less from image interference
is a more sensitive receiver
produces a louder audio signal

A-006-02-01 (4)
The mixer stage of a superheterodyne receiver is used to:
allow a number of IF frequencies to be used
remove image signals from the receiver
produce an audio frequency for the speaker
change the frequency of the incoming signal to that of the IF

A-006-02-02 (1)
A superheterodyne receiver designed for SSB reception must have a beat-frequency oscillator (BFO) because:
the suppressed carrier must be replaced for detection
it phases out the unwanted sideband signal
it reduces the pass-band of the IF stages
it beats with the receiver carrier to produce the missing sideband

A-006-02-03 (4)
The first mixer in the receiver mixes the incoming signal with the local oscillator to produce:
an audio frequency
a radio frequency
a high frequency oscillator (HFO) frequency
an intermediate frequency

A-006-02-04 (1)
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 high frequency oscillator (HFO) operate?
5 400 kHz
3 400 kHz
10 600 kHz
21 600 kHz

A-006-02-05 (1)
The BFO is off-set slightly (500 - 1 500 Hz) from the incoming signal to the detector. This is required:
to beat with the incoming signal
to pass the signal without interruption
to provide additional amplification
to protect the incoming signal from interference

A-006-02-06 (1)
It is very important that the oscillators contained in a superheterodyne receiver are:
stable and spectrally pure
sensitive and selective
stable and sensitive
selective and spectrally pure

A-006-02-07 (4)
In a superhetrodyne 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:
tuning both the antenna and the BFO
tuning of the beat-frequency oscillator (BFO)
tuning both the antenna and the HFO
tuning of the high-frequency oscillator (HFO)

A-006-02-08 (4)
In a superhetrodyne 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:
tuning both the antenna and the BFO
tuning the beat-frequency oscillator (BFO)
tuning both the antenna and the HFO
tuning of the antenna

A-006-02-09 (4)
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?
BFO
VFO
Multiplier
Mixer

A-006-02-10 (4)
Which two stages in a superheterodyne receiver have input tuned circuits tuned to the same frequency?
IF and local oscillator
RF and IF
RF and local oscillator
RF and first mixer

A-006-02-11 (1)
The mixer stage of a superheterodyne receiver:
produces an intermediate frequency
produces spurious signals
acts as a buffer stage
demodulates SSB signals

A-006-03-01 (4)
What is meant by the noise floor of a receiver?
The weakest signal that can be detected under noisy atmospheric conditions
The minimum level of noise that will overload the receiver RF amplifier stage
The amount of noise generated by the receiver local oscillator
The weakest signal that can be detected above the receiver internal noise

A-006-03-02 (2)
Which of the following is a purpose of the first IF amplifier stage in a receiver?
To tune out cross-modulation distortion
To improve selectivity
To increase dynamic response
To improve noise figure performance

A-006-03-03 (2)
How much gain should be used in the RF amplifier stage of a receiver?
As much gain as possible, short of self-oscillation
Sufficient gain to allow weak signals to overcome noise generated in the first mixer stage
It depends on the amplification factor of the first IF stage
Sufficient gain to keep weak signals below the noise of the first mixer stage

A-006-03-04 (4)
What is the primary purpose of an RF amplifier in a receiver?
To vary the receiver image rejection by using the AGC
To develop the AGC voltage
To provide most of the receiver gain
To improve the receiver noise figure

A-006-03-05 (3)
What is the primary source of noise that can be heard in a VHF/UHF band receiver with its antenna connected?
Detector noise
Atmospheric noise
Receiver front-end noise
Man-made noise

A-006-03-06 (2)
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)?
design parameter
dynamic range
stability
noise figure

A-006-03-07 (3)
The lower the receiver noise figure becomes, the greater will be the receiver's _________ :
rejection of unwanted signals
selectivity
sensitivity
stability

A-006-03-08 (3)
The noise generated in a receiver of good design originates in the:
detector and AF amplifier
BFO and detector
RF amplifier and mixer
IF amplifier and detector

A-006-03-09 (2)
Why are very low noise figures relatively unimportant for a ionospheric distortion of high frequency receiver? the received signal creates high noise levels
external HF noise, man-made and natural, are higher than the internal noise generated by the receiver
the use of SSB and CW on the HF bands overcomes the noise
regardless of the front end, the succeeding stages when used on HF are very noisy

A-006-03-10 (1)
The term which relates specifically to the amplitude levels of multiple signals that can be accommodated during reception is called:
dynamic range
AGC
cross-modulation index
noise figure

A-006-03-11 (4)
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:
preamble
preamplifier
pass-selector
preselector

A-006-04-01 (2)
What audio shaping network is added at an FM receiver to restore proportionally attenuated lower audio frequencies?
A pre-emphasis network
A de-emphasis network
An audio prescaler
A heterodyne suppressor

A-006-04-02 (4)
What does a product detector do?
It provides local oscillations for input to a mixer
It amplifies and narrows band-pass frequencies
It detects cross-modulation products
It mixes an incoming signal with a locally generated carrier

A-006-04-03 (2)
Distortion in a receiver that only affects strong signals usually indicates a defect in the:
IF amplifier
AGC
AF amplifier
RF amplifier

A-006-04-04 (1)
In a superheterodyne receiver with AGC, as the strength of the signal increases, the AGC:
reduces the receiver gain
increases the receiver gain
distorts the signal
introduces limiting

A-006-04-05 (2)
The amplified IF signal is applied to the ____________ stage in a superheterodyne receiver:
RF amplifier
detector
audio output
HFO

A-006-04-06 (1)
The low-level output of a detector is:
applied to the AF amplifier
grounded via the chassis
fed directly to the speaker
applied to the RF amplifier

A-006-04-07 (3)
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:
automatic frequency control
inverse gain control
automatic gain control
automatic load control

A-006-04-08 (4)
AGC voltage is applied to the:
AF and IF amplifiers
RF and AF amplifiers
detector and AF amplifiers
RF and IF amplifiers

A-006-04-09 (2)
AGC is derived in a receiver from one of two circuits. Depending on the method used, it is called:
RF derived or audio derived
IF derived or audio derived
IF derived or RF derived
detector derived or audio derived

A-006-04-10 (4)
In a superhetrodyne receiver, the output of an oscillator is connected to a transformer. What is the function of the transformer?
It provides isolation between the high-frequency oscillator and the detector
It provides tuning for the output of the intermediate frequency amplifier
It provides tuning for the input of the intermediate frequency amplifier
It provides coupling between the beat-frequency oscillator and the detector

A-006-04-11 (4)
What circuit combines signals from an IF amplifier stage and a beat-frequency oscillator (BFO), to produce an audio signal?
An AGC circuit
A power supply circuit
A VFO circuit
A detector circuit

A-006-05-01 (4)
What part of a superheterodyne receiver determines the image rejection ratio of the receiver?
Product detector
AGC loop
IF filter
RF amplifier

A-006-05-02 (2)
What is the term for the reduction in receiver sensitivity caused by a strong signal near the received frequency?
Cross-modulation interference
Desensitization
Squelch gain rollback
Quieting

A-006-05-03 (3)
What causes receiver desensitization?
Squelch gain adjusted too high
Squelch gain adjusted too low
Strong adjacent channel signals
Audio gain adjusted too low

A-006-05-04 (2)
What is one way receiver desensitization can be reduced?
Decrease the receiver squelch gain
Shield the receiver from the transmitter causing the problem
Increase the receiver bandwidth
Increase the transmitter audio gain

A-006-05-05 (1)
What causes intermodulation in an electronic circuit?
Nonlinear circuits or devices
Too little gain
Positive feedback
Lack of neutralization

A-006-05-06 (1)
Which of the following is an important reason for using a VHF intermediate frequency in an HF receiver?
To move the image response far away from the filter passband
To provide a greater tuning range
To tune out cross-modulation distortion
To prevent the generation of spurious mixer products

A-006-05-07 (2)
Intermodulation distortion is produced by:
the interaction of products from high-powered transmitters in the area
the mixing of more than one signal in the mixer of a superheterodyne receiver
the high-voltage stages in the final amplifier of an amplitude or frequency-modulated transmitter
the mixing of more than one signal in the first or second intermediate frequency amplifiers of a receiver

A-006-05-08 (4)
Three of the following answers are direct causes of instability in a receiver. Choose the answer which is NOT a direct cause:
mechanical strength
feedback components
temperature
dial tracking

A-006-05-09 (2)
Poor stability in a receiver usually originates in the:
detector
local oscillator and power supply
RF amplifier
mixer

A-006-05-10 (4)
Poor dynamic range of a receiver can cause many problems when a strong signal appears within the front-end bandpass or even outside it. Which of the following is NOT caused as a direct result?
Desensitization
Intermodulation
Cross-modulation
Feedback

A-006-05-11 (3)
If a receiver mixes a 13.800-MHz VFO with a 14.255-MHz received signal to produce a 455-kHz intermediate frequency (IF) signal, what type of interference will a 13.345-MHz signal produce in the receiver?
Intermediate interference
Mixer interference
Image response
Local oscillator

A-007-01-01 (3)
For an antenna tuner of the "Transformer" type, which of the following statements is FALSE?
The input is suitable for 50 ohm impedance
The output is suitable for impedances from low to high
The circuit is known as a Pi-type antenna tuner (transmatch)
The circuit is known as a transformer-type antenna tuner (transmatch)

A-007-01-02 (4)
For an antenna tuner of the "Series" type, which of the following statements is FALSE?
The circuit is known as a Series-type antenna tuner (transmatch)
The output is suitable for impedances from low to high
The input is suitable for impedance of 50 ohms
The circuit is known as a Pi-type antenna tuner (transmatch)

A-007-01-03 (3)
For an antenna tuner of the "L" type, which of the following statements is FALSE?
The transmitter input is suitable for 50 ohms impedance
The antenna output is high impedance
The circuit is suitable for matching to a vertical groundplane antenna
The circuit is known as an L-type antenna tuner (transmatch)

A-007-01-04 (3)
For an antenna tuner of the "Pi" type, which of the following statements is FALSE?
The transmitter input is suitable for impedance of 50 ohms
The antenna output is suitable for impedances from low to high
The circuit is a series- type antenna tuner (transmatch)
The circuit is a Pi-type antenna tuner (transmatch)

A-007-01-05 (3)
What is a pi-network?
An antenna matching network that is isolated from ground
A network consisting of four inductors or four capacitors
A network consisting of one inductor and two capacitors or two inductors and one capacitor
A power incidence network

A-007-01-06 (3)
Which type of network offers the greatest transformation ratio?
Chebyshev
Butterworth
Pi-network
L-network

A-007-01-07 (2)
Why is an L-network of limited utility in impedance matching?
It is thermally unstable
It matches only a small impedance range
It is prone to self-resonance
It has limited power handling capability

A-007-01-08 (3)
How does a network transform one impedance to another?
It produces transconductance to cancel the reactive part of an impedance
It introduces negative resistance to cancel the resistive part of an impedance
It cancels the reactive part of an impedance and changes the resistive part
Network resistances substitute for load resistances

A-007-01-09 (1)
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?
Greater harmonic suppression
Higher efficiency
Lower losses
Greater transformation range

A-007-01-10 (3)
Which type of network provides the greatest harmonic suppression?
Inverse pi-network
Pi-network
Pi-L network
L-network

A-007-01-11 (3)
Which three types of networks are most commonly used to match an RF power amplifier to a transmission line?
T, M and Q
M, pi and T
L, pi and pi-L
L, M and C

A-007-02-01 (3)
What kind of impedance does a quarter wavelength transmission line present to the source when the line is shorted at the far end?
The same as the characteristic impedance of the transmission line
The same as the output impedance of the source
A very high impedance
A very low impedance

A-007-02-02 (4)
What kind of impedance does a quarter wavelength transmission line present to the source if the line is open at the far end?
A very high impedance
The same as the output impedance of the source
The same as the characteristic impedance of the transmission line
A very low impedance

A-007-02-03 (3)
What kind of impedance does a half wavelength transmission line present to the source when the line is open at the far end?
The same as the characteristic impedance of the transmission line
The same as the output impedance of the source
A very high impedance
A very low impedance

A-007-02-04 (3)
What kind of impedance does a half wavelength transmission line present to the source when the line is shorted at the far end?
A very high impedance
The same as the characteristic impedance of the transmission line
A very low impedance
The same as the output impedance of the source

A-007-02-05 (3)
What is the velocity factor of a transmission line?
The velocity of the wave on the transmission line multiplied by the velocity of light in a vacuum
The index of shielding for coaxial cable
The velocity of the wave on the transmission line divided by the velocity of light
The ratio of the characteristic impedance of the line to the terminating impedance

A-007-02-06 (4)
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?
Characteristic impedance
Surge impedance
Standing wave ratio
Velocity factor

A-007-02-07 (2)
What is a typical velocity factor for coaxial cable with polyethylene dielectric?
0.33
0.66
0.1
2.7

A-007-02-08 (4)
What determines the velocity factor in a transmission line?
The line length
The centre conductor resistivity
The terminal impedance
Dielectrics in the line

A-007-02-09 (4)
Why is the physical length of a coaxial cable shorter than its electrical length?
The surge impedance is higher in the parallel feed line
Skin effect is less pronounced in the coaxial cable
The characteristic impedance is higher in a parallel feed line
RF energy moves slower along the coaxial cable than in air

A-007-02-10 (1)
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:
velocity factor
VSWR
impedance
hermetic losses

A-007-02-11 (1)
The velocity factor of a transmission line is the:
ratio of the velocity of propagation in the transmission line to the velocity of propagation in free space
impedance of the line, e.g. 50 ohm, 75 ohm, etc.
speed at which the signal travels in free space
speed to which the standing waves are reflected back to the transmitter

A-007-03-01 (4)
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?
The gamma match
The omega match
The stub match
The T match

A-007-03-02 (2)
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?
The omega match
The gamma match
The stub match
The T match

A-007-03-03 (1)
What term describes a method of antenna impedance matching that uses a short section of transmission line connected to the antenna feed line near the antenna and perpendicular to the feed line?
The stub match
The omega match
The delta match
The gamma match

A-007-03-04 (4)
What would be the physical length of a typical coaxial stub that is electrically one quarter wavelength long at 14.1 MHz? (Assume a velocity factor of 0.66)
20 metres (65.6 feet)
2.33 metres (7.64 feet)
0.25 metre (0.82 foot)
3.51 metres (11.5 feet)

A-007-03-05 (1)
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:
gamma match
lambda match
"T" match
zeta match

A-007-03-06 (3)
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:
12 m (39.4 ft)
8 m (26.2 ft)
4 m (13.1 ft)
7.5 m (24.6 ft)

A-007-03-07 (1)
The matching of a driven element with a single adjustable mechanical and capacitive arrangement is descriptive of:
a "gamma" match
a "T" match
an "omega" match
a "Y" match

A-007-03-08 (1)
A Yagi antenna uses a gamma match. The coaxial braid connects to:
the centre of the driven element
the variable capacitor
the adjustable gamma rod
the centre of the reflector

A-007-03-09 (1)
A Yagi antenna uses a gamma match. The centre of the driven element connects to:
the coaxial line braid
the coaxial line centre conductor
the adjustable gamma rod
a variable capacitor

A-007-03-10 (2)
A Yagi antenna uses a gamma match. The adjustable gamma rod connects to:
the coaxial line centre conductor
the variable capacitor
an adjustable point on the reflector
the centre of the driven element

A-007-03-11 (4)
A Yagi antenna uses a gamma match. The variable capacitor connects to the:
an adjustable point on the director
center of the driven element
coaxial line braid
adjustable gamma rod

A-007-04-01 (4)
In a half-wave dipole, the distribution of _______ is highest at each end.
current
inductance
capacitance
voltage

A-007-04-02 (4)
In a half-wave dipole, the distribution of _______ is lowest at each end.
voltage
inductance
capacitance
current

A-007-04-03 (2)
The feed point in a centre-fed half-wave antenna is at the point of:
minimum current
maximum current
minimum voltage and current
maximum voltage

A-007-04-04 (4)
In a half-wave dipole, the lowest distribution of _________ occurs at the middle.
capacity
inductance
current
voltage

A-007-04-05 (3)
In a half-wave dipole, the highest distribution of ________ occurs at the middle.
inductance
voltage
current
capacity

A-007-04-06 (1)
A half-wave dipole antenna is normally fed at the point where:
the current is maximum
the voltage is maximum
the resistance is maximum
the antenna is resonant

A-007-04-07 (4)
At the ends of a half-wave dipole:
voltage and current are both high
voltage and current are both low
voltage is low and current is high
voltage is high and current is low

A-007-04-08 (3)
The impedance of a half-wave antenna at its centre is low, because at this point:
voltage and current are both high
voltage and current are both low
voltage is low and current is high
voltage is high and current is low

A-007-04-09 (3)
In a half-wave dipole, where does minimum voltage occur?
At the right end
It is equal at all points
The centre
Both ends

A-007-04-10 (1)
In a half-wave dipole, where does the minimum current occur?
At both ends
At the centre
It is equal at all points
At the right end

A-007-04-11 (2)
In a half-wave dipole, where does the minimum impedance occur?
It is the same at all points
At the centre
At the right end
At both ends

A-007-05-01 (4)
What is meant by circularly polarized electromagnetic waves?
Waves with an electric field bent into circular shape
Waves that circle the earth
Waves produced by a circular loop antenna
Waves with a rotating electric field

A-007-05-02 (3)
What is the polarization of an electromagnetic wave if its magnetic field is parallel to the surface of the Earth?
Elliptical
Circular
Vertical
Horizontal

A-007-05-03 (4)
What is the polarization of an electromagnetic wave if its magnetic field is perpendicular to the surface of the Earth?
Vertical
Circular
Elliptical
Horizontal

A-007-05-04 (2)
The polarization of a radio wave is taken as the direction of the lines of force in the _______ field:
force
electric
magnetic
electromagnetic

A-007-05-05 (1)
A transmitted wave is vertically polarized when:
its electrical component is vertical
the antenna is pointing north in the northern hemisphere
the antenna is parallel to the ground
its magnetic component is vertical

A-007-05-06 (4)
The polarisation of an antenna is the :
orientation of its radiated magnetic field
length of the radiating element
radiation angle
orientation of its radiated electric field

A-007-05-07 (4)
A parabolic antenna is very efficient because:
a dipole antenna can be used to pick up the received energy
no impedance matching is required
a horn-type radiator can be used to trap the received energy
all the received energy is focused to a point where the pick-up antenna is located

A-007-05-08 (1)
A helical-beam antenna with right-hand polarization will best receive signals with:
right-hand polarization
left-hand polarization
vertical polarization only
horizontal polarization

A-007-05-09 (1)
One antenna which will respond simultaneously to vertically- and horizontally-polarized signals is the:
helical-beam antenna
folded dipole antenna
ground-plane antenna
quad antenna

A-007-05-10 (1)
What precaution should you take whenever you make adjustments to the feed system of a parabolic dish antenna?
Be sure no one can activate the transmitter
Disconnect the antenna- positioning mechanism
Point the dish away from the sun so it doesn't concentrate solar energy on you
Be sure you and the antenna structure are properly grounded

A-007-05-11 (1)
Why should a protective fence be placed around the base of a ground-mounted parabolic dish transmitting antenna?
To reduce the possibility of persons being harmed by RF energy during transmissions
To reduce the possibility that animals will damage the antenna
To increase the property value through increased security awareness
To protect the antenna from lightning damage and provide a good ground system for the installation

A-007-06-01 (2)
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 dB. What is the Effective Radiated Power?
350 watts
200 watts
400 watts
300 watts

A-007-06-02 (4)
As standing wave ratio rises, so does the loss in the transmission line. This is caused by:
high antenna currents
high antenna voltage
leakage to ground through the dielectric
dielectric and conductor heat losses

A-007-06-03 (4)
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 dB?
197 watts
228 watts
178 watts
390 watts

A-007-06-04 (1)
Effective Radiated Power means the:
transmitter output power, minus line losses, plus antenna gain
power supplied to the antenna before the modulation of the carrier
power supplied to the feedline plus antenna gain
ratio of signal output power to signal input power

A-007-06-05 (3)
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 dB. What is the approximate Effective Radiated Power of this system?
3200 watts
1600 watts
800 watts
400 watts

A-007-06-06 (3)
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 transmatch, and a gain of 4.50 dB in the antenna. The Effective Radiated Power (ERP) is:
800 watts
400 watts
200 watts
100 watts

A-007-06-07 (3)
If the overall gain of an amateur station is increased by 3 dB the ERP (Effective Radiated Power) will:
decrease by 3 watts
remain the same
double
be cut in half

A-007-06-08 (4)
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 transmatch, and a gain of 10 dB in the antenna. The Effective Radiated Power (ERP) is:
1250
1125
134
1000

A-007-06-09 (2)
If a 3 dB gain antenna is replaced with a 9 dB gain antenna, with no other changes, the Effective Radiated Power (ERP) will increase by:
6
4
1.5
2

A-007-06-10 (4)
A transmitter has an output of 2000 watts PEP. The transmission line, connectors and transmatch have a composite loss of 1 dB, and the gain from the stacked Yagi antenna is 10 dB. What is the Effective Radiated Power (ERP) in watts PEP?
18 000
20 000
2009
16 000

A-007-06-11 (3)
A transmitter has an output of 1000 watts PEP. The coaxial cable, connectors and transmatch have a composite loss of 1 dB, and the antenna gain is 10 dB. What is the Effective Radiated Power (ERP) in watts PEP?
1009
10 000
8000
9000

A-007-07-01 (1)
For a 3-element Yagi antenna with horizontally mounted elements, how does the main lobe takeoff angle vary with height above flat ground?
It decreases with increasing height
It increases with increasing height
It does not vary with height
It depends on E-region height, not antenna height

A-007-07-02 (3)
Most simple horizontally polarized antennas do not exhibit any directivity unless they are:
an eighth of a wavelength above the ground
a quarter wavelength above the ground
a half wavelength or more above the ground
three-eighths of a wavelength above the ground

A-007-07-03 (2)
The plane from which ground reflections can be considered to take place, or the effective ground plane for an antenna is:
as much as 6 cm below ground depending upon soil conditions
several centimeters to as much as 2 meters below ground, depending upon soil conditions
as much as a meter above ground
at ground level exactly

A-007-07-04 (2)
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?
The radiation resistance is lower
The vertical radiation angle is lower
It has an omnidirectional characteristic
It uses vertical polarization

A-007-07-05 (4)
When a half-wave dipole antenna is installed one-half wavelength above ground, the:
radiation pattern changes to produce side lobes at 15 and 50 degrees
side lobe radiation is cancelled
radiation pattern is unaffected
vertical or upward radiation is cancelled

A-007-07-06 (2)
How does antenna height affect the horizontal (azimuthal) radiation pattern of a horizontal dipole HF antenna?
Antenna height has no effect on the pattern
If the antenna is less than one-half wavelength high, reflected radio waves from the ground significantly distort the pattern
If the antenna is less than one-half wavelength high, radiation off the ends of the wire is eliminated
If the antenna is too high, the pattern becomes unpredictable

A-007-07-07 (2)
For long distance propagation, the vertical radiation angle of the energy from the antenna should be:
more than 45 degrees but less than 90 degrees
less than 30 degrees
90 degrees
more than 30 degrees but less than 45 degrees

A-007-07-08 (2)
Greater distance can be covered with multiple-hop transmissions by decreasing the:
power applied to the antenna
vertical radiation angle of the antenna
main height of the antenna
length of the antenna

A-007-07-09 (1)
The impedance at the centre of a dipole antenna more than 3 wavelengths above ground would be nearest to:
75 ohms
25 ohms
300 ohms
600 ohms

A-007-07-10 (2)
What is the main reason why so many VHF base and mobile antennas are 5/8 of a wavelength?
The angle of radiation is high giving excellent local coverage
Most of the energy is radiated at a low angle
It's easy to match the antenna to the transmitter
It's a convenient length on VHF

A-007-07-11 (1)
The most important consideration when deciding upon an antenna for contacting stations at great distances (DX) is:
vertical angle of radiation
sunspot activity
impedance
bandwidth

A-007-08-01 (4)
What is meant by the radiation resistance of an antenna?
The resistance in the atmosphere that an antenna must overcome to be able to radiate a signal
The specific impedance of an antenna
The combined losses of the antenna elements and feed line
The equivalent resistance that would dissipate the same amount of power as that radiated from an antenna

A-007-08-02 (3)
Why would one need to know the radiation resistance of an antenna?
To measure the near-field radiation density from a transmitting antenna
To calculate the front-to-side ratio of the antenna
To match impedances for maximum power transfer
To calculate the front-to-back ratio of the antenna

A-007-08-03 (1)
What factors determine the radiation resistance of an antenna?
Antenna location with respect to nearby objects and the conductors length/diameter ratio
Transmission line length and antenna height
Sunspot activity and time of day
It is a physical constant and is the same for all antennas

A-007-08-04 (4)
What is the term for the ratio of the radiation resistance of an antenna to the total resistance of the system?
Beamwidth
Effective Radiated Power
Radiation conversion loss
Antenna efficiency

A-007-08-05 (2)
What is included in the total resistance of an antenna system?
Radiation resistance plus transmission resistance
Radiation resistance plus ohmic resistance
Transmission line resistance plus radiation resistance
Radiation resistance plus space impedance

A-007-08-06 (2)
How can the approximate beamwidth of a beam antenna be determined?
Draw two imaginary lines through the ends of the elements and measure the angle between the lines
Note the two points where the signal strength is down 3 dB from the maximum signal point and compute the angular difference
Measure the ratio of the signal strengths of the radiated power lobes from the front and side of the antenna
Measure the ratio of the signal strengths of the radiated power lobes from the front and rear of the antenna

A-007-08-07 (4)
How is antenna percent efficiency calculated?
(radiation resistance / transmission resistance) X 100
(total resistance / radiation resistance) X 100
(effective radiated power / transmitter output) X 100
(radiation resistance / total resistance) X 100

A-007-08-08 (1)
What is the term used for an equivalent resistance which would dissipate the same amount of energy as that radiated from an antenna?
Radiation resistance
"j" factor
Antenna resistance
"K" factor

A-007-08-09 (1)
Antenna beamwidth is the angular distance between :
the points on the major lobe at the half-power points
the maximum lobe spread points on the major lobe
the 6 dB power points on the major lobe
the 3 dB power points on the first minor lobe

A-007-08-10 (3)
If the ohmic resistance of a half-wave dipole is 2 ohms, and the radiation resistance is 72 ohms, what is the antenna efficiency?
74%
72%
97.3%
100%

A-007-08-11 (2)
If the ohmic resistance of a miniloop antenna is 2 milliohms and the radiation resistance is 50 milliohms, what is the antenna efficiency?
52%
96.15%
25%
50%

A-007-09-01 (2)
Waveguide is typically used:
at frequencies above 2 MHz
at frequencies above 1500 MHz
at frequencies below 150 MHz
at frequencies below 1500 MHz

A-007-09-02 (3)
Which of the following is NOT CORRECT? Waveguide is an efficient transmission medium because it features :
low radiation loss
low dielectric loss
low hysteresis loss
low copper loss

A-007-09-03 (2)
Which of the following is an advantage of waveguide as a transmission line?
Frequency sensitive based on dimensions
Low loss
Expensive
Heavy and difficult to install

A-007-09-04 (3)
For rectangular waveguide to transfer energy, the cross- section should be at least:
three-eighths wavelength
one-eighth wavelength
one-half wavelength
one-quarter wavelength

A-007-09-05 (2)
Which of the following statements about waveguide IS NOT correct?
In the transverse electric mode, a component of the magnetic field is in the direction of propagation
Waveguide has high loss at high frequencies, but low loss below cutoff frequency
In the transverse magnetic mode, a component of the electric field is in the direction of propagation
Waveguide has low loss at high frequencies, but high loss below cutoff frequency

A-007-09-06 (3)
Which of the following is a major advantage of waveguide over coaxial cable for use at microwave frequencies?
Frequency response from 1.8 MHz to 24 GHz
Easy to install
Very low losses
Inexpensive to install

A-007-09-07 (2)
What is printed circuit transmission line called?
Dielectric substrate
Microstripline
Dielectric imprinting
Ground plane

A-007-09-08 (1)
Compared with coaxial cable, microstripline:
has poorer shielding
has superior shielding
must have much lower characteristic impedance
must have much higher characteristic impedance

A-007-09-09 (4)
A section of waveguide:
operates like a low-pass filter
operates like a band-stop filter
is lightweight and easy to install
operates like a high-pass filter

A-007-09-10 (4)
Microstripline is:
a small semiconductor family
a high power microwave antenna
a family of fluids for removing coatings from small parts
printed circuit transmission line

A-007-09-11 (2)
What precautions should you take before beginning repairs on a microwave feed horn or waveguide?
Be sure the weather is dry and sunny
Be sure the transmitter is turned off and the power source is disconnected
Be sure propagation conditions are unfavorable for tropospheric ducting
Be sure to wear tight-fitting clothes and gloves to protect your body and hands from sharp edge