



## **Amateur Radio Operator Certificate Examination**

### **Advanced Qualification**

**2024-05-18**

**To pass this exam, you must correctly answer 35 out of 50 questions**

Exam Number: 973329

1. (A-006-002-002)

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

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

2. (A-005-005-008)

Some types of deviation meters work on the principle of:

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

3. (A-001-004-005)

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

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

4. (A-003-004-011)

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

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

5. (A-004-002-004)

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

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

6. (A-005-001-010)

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

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

7. (A-006-005-001)

What part of a superheterodyne receiver determines the image rejection ratio of the receiver?

- A. IF filter
- B. AGC loop
- C. RF amplifier pre-selector
- D. Product detector

8. (A-004-001-003)

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

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

9. (A-004-003-010)

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

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

10. (A-003-005-006)

The bandwidth of an oscilloscope is:

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

11. (A-003-002-001)

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

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

12. (A-002-011-004)

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

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

13. (A-005-006-007)

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

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

14. (A-002-002-007)

What is a common use for point contact diodes?

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

15. (A-007-008-008)

What is the term used for an equivalent resistance which would dissipate the same amount of energy as that radiated from an antenna?

- A. Radiation resistance
- B. K factor
- C. Antenna resistance
- D. j factor

16. (A-001-002-006)

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

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

17. (A-007-006-003)

What is the Effective Radiated Power of an amateur transmitter, if the transmitter output power is 200 watts, the transmission line loss is 5 watts, and the antenna power gain is 3 dBd?

- A. 228 watts
- B. 390 watts
- C. 178 watts
- D. 197 watts

18. (A-002-006-011)

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

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

19. (A-004-004-004)

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

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

20. (A-002-009-001)

What is the mixing process?

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

21. (A-007-004-004)

In a half-wave dipole, the lowest distribution of \_\_\_\_\_ occurs at the middle.

- A. capacity
- B. current
- C. inductance
- D. voltage

22. (A-002-001-005)

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

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

23. (A-003-003-004)

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

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

24. (A-005-009-011)

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

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

25. (A-001-001-002)

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

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

26. (A-003-006-003)

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

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

27. (A-005-008-005)

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

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

28. (A-007-003-010)

A Yagi antenna uses a gamma match. The adjustable gamma rod connects to:

- A. an adjustable point on the reflector
- B. the centre of the driven element
- C. the variable capacitor
- D. the coaxial line centre conductor



29. (A-002-007-002)

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

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

30. (A-003-001-007)

AC voltmeter scales are usually calibrated to read:

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

31. (A-005-003-007)

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

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

32. (A-005-002-010)

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

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

33. (A-006-003-003)

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

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

34. (A-001-003-008)

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

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

35. (A-007-007-005)

When a half-wave dipole antenna is installed one-half wavelength above ground, the:

- A. vertical or upward radiation is effectively cancelled
- B. radiation pattern is unaffected
- C. side lobe radiation is cancelled
- D. radiation pattern changes to produce side lobes at 15 and 50 degrees

36. (A-002-003-008)

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

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

37. (A-002-012-005)

Resonant cavities are used by amateurs as a:

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

38. (A-002-005-004)

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

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

39. (A-002-004-008)

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

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

40. (A-005-007-008)

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

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

41. (A-001-005-002)

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

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

42. (A-002-008-005)

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

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

43. (A-006-001-001)

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

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

44. (A-005-004-001)

What type of signal does a balanced modulator produce?

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

45. (A-007-001-011)

A Smith Chart is useful:

- A. to solve problems in direct current circuits
- B. because it only works with complex numbers
- C. because it simplifies mathematical operations
- D. only to solve matching and transmission line problems

46. (A-002-010-010)

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

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

47. (A-007-005-007)

A parabolic antenna is very efficient because:

- A. a dipole antenna can be used to pick up the received energy
- B. a horn-type radiator can be used to trap the received energy
- C. no impedance matching is required
- D. all the received energy is focused to a point where the pick-up antenna is located

48. (A-007-002-011)

The velocity factor of a transmission line is the:

- A. impedance of the line, e.g. 50 ohm, 75 ohm, etc.
- B. speed to which the standing waves are reflected back to the transmitter
- C. speed at which the signal travels in free space
- D. ratio of the velocity of propagation in the transmission line to the velocity of propagation in free space

49. (A-006-004-011)

What circuit combines signals from an IF amplifier stage and a beat-frequency oscillator (BFO), to produce an audio signal?

- A. An AGC circuit
- B. A product detector circuit
- C. A VFO circuit
- D. A power supply circuit

50. (A-007-009-005)

Which of the following statements about waveguide IS NOT correct?

- A. In the transverse magnetic mode, a component of the electric field is in the direction of propagation
- B. Waveguide has low loss at high frequencies, but high loss below cutoff frequency
- C. In the transverse electric mode, a component of the magnetic field is in the direction of propagation
- D. Waveguide has high loss at high frequencies, but low loss below cutoff frequency