

FCC ELEMENT 6

THE POOL OF 616 QUESTIONS FROM WHICH 100 WILL BE DRAWN FOR THE EXAM

I made this for me, and share it for free. It comes to you without warranty, absent of promise, and sans guarantee.

– Gan Uesli Starling, KY8D, 2018-07-30

Notes:

1. Derived from plural on-line sources, this compilation tailored to suit personal preference and study habit.
2. Only the *officially correct* answers are here kept.
 - a. Sometimes these are plural.
 - b. All such will here be shown in their full, original text.
 - c. Whereas on the test I'll be needing to choose either '*Both X and Y*', or '*All of the above*'.
3. Cases where a *wrong* answer needs its wrongness explained will kept but *shown like this*.
3. Attend to brackets, like so: **[Find comments and/or clarifications here]**
4. Real-world test includes typographical errors. Herein I show such as follows: ~~type~~ **correction**

#1 SITOR-ARQ is a common mode of data communications in the maritime service. It is a system based on transmission bursts and acknowledgments. What is the baud, and interval between the burst transmissions:

A. 100 baud, 240 ms interval

[Simplex Teletype Over Radio – Automatic Repeat Query]

#2 Weather information is commonly sent by radio in map form by one-way facsimile transmission. Two common parameters which must be set by the receiving station are:

D. Index of cooperation (IOC), and revolutions per minute (RPM)

#3 2182 kHz is the international radiotelephone distress frequency. It is also used for a calling channel. The authorized mode of emission is H3E (single-sideband full carrier). A3E (double-sideband full carrier) is only authorized for equipment:

A. Solely intended for distress and safety communications

#4 Ship's power is generated as 3-phase and is ungrounded. On a delta-wound transformer with 120 VAC line-to-line secondary, what is the voltmeter reading from line to ground:

A. Approx 67 volts for a normal balanced system with no faults

B. 0 VAC for a system with that phase faulted to ground

C. 120 VAC when another phase is faulted to ground

#5 When passing through areas of static charge, high voltages can accumulate on antennas which are insulated from ground. What protects a connected receiver from damage?

Any combination of the below!

A. Lightning arresters and suppressors

B. Protection diodes on receiver input

C. Capacitive coupling and static dissipative circuits

- #6 Vertical shipboard antennas for use in the MF band (410-525 kHz) are often fitted with top-hat loading sections. What is the purpose of these structures?
B. Permits a physically short antenna to appear electrically longer
- #7 Modern reserve transmitters are solid-state designs and transmit using only A2 modulation. When measuring transmitter center frequency, what precaution must be taken:
B. Modulation must be reduced to zero to eliminate sidebands
- #8 Voltage may be expressed by what other expression?
A. Difference of potential
B. ~~HF~~ IR drop
C. Electromotive force
- #9 Amperage may also be known by:
D. All of the above
- #10 Factors which determine the amplitude of the voltage induced in a conductor which is cutting magnetic lines of force:
A. Flux density
B. Velocity that the conductor cuts the magnetic lines of force
C. The angle at which the conductor cuts through the magnetic lines of force
- #11 An electrical potential may be generated by:
A. Varying a magnetic field through a circuit
B. Chemical action
C. Photo-electric action
- #12 Ohm's law is stated as:
A. $E = IR$
B. $I = E / R$
C. $R = E / I$
- #13 The unit of electrical power is:
A. Watt
B. Joule per seconde
- #14 The unit of conductance is:
B. Mho
- #15 The unit of inductance is:
A. Henry
- #16 The ratio of current through a conductor to the voltage which produces it is:
B. Conductance
- #17 The product of the number of turns and the current in amperes used to describe relative magnitude is:
A. Ampere turns

- #18 The property of a conductor or coil which causes a voltage to be developed across its terminals when the number of magnetic lines of force in the circuit or coil is changed is:
B. Inductance
- #19 The charge of electricity which passes a given point in one second when a current of one ampere is flowing is:
A. Coulomb
- #20 C = capacity in farads. Q = the measure of the quantity of charge of electricity in Coulombs. E = the applied voltage. So $Q = CE$:
A. Determines the quantity of charge in a capacitor
- #21 Resistance is:
A. The quantity which determines power loss or dissipation
B. The factor of proportionality between voltage and current
C. Measured in ohms
- #22 The unit of AC impedance in a circuit is:
A. Ohm
- #23 The unit of capacitance is:
A. Farad
B. Microfarad
- #24 Decibel is:
A. The unit used to express the ratio between two sound power levels
B. The unit used to express the ratio between two electrical power levels
- #25 What factors determine the charge stored in a capacitor?
A. Capacitance of the capacitor
B. The applied voltage
- #26 Ohm's law for AC circuits when I = amperes, E = volts, Z = impedance in volts is:
A. $I = E/Z$
B. $E = IZ$
C. $Z = \cancel{Z/I} E/I$
- #27 The formula for determining the power in a DC circuit when the voltage and resistance are known is:
A. $P = (E \text{ squared})/R$
[Typo for lack of '/' before 'R'. Shown as corrected.]
- #28 The formula for finding power in a DC circuit when current and resistance are known:
B. $P = (I \text{ Squared}) R$
- #29 The formula for finding power in a DC circuit when current and voltage are known:
A. $P = EI$
- #30 The prefix " kilo " means:
A. To multiply by 1000 whatever quantity follows
- #31 The prefix " micro " means:

- A. Divide by 1,000,000 whatever quantity follows
- #32 The factor by which the product of volts and amperes must be multiplied to obtain true power is:
- A. Power factor
- #33 The prefix " meg " means:
- A. Multiply by 1,000,000 whatever quantity follows
- #34 Factors which influence the resistance of a conductor:
- A. Cross-sectional area
- B. Length
- C. Temperature
- #35 Halving the cross-sectional area of a conductor will:
- A. Double the resistance
- #36 Name four conducting materials in order of their conductivity.
- B. Silver, gold, zinc, platinum
- #37 Good insulators at radio frequencies are:
- A. Pyrex, mica
- B. Isolantite, steatite, polyethylene
- #38 A resistance across which a constant voltage is applied is doubled. What power dissipation will result?
- A. One half
- #39 The needle of a magnetic compass when placed within a coil carrying an electric current:
- A. Will tend to become parallel with the axis of the coil
- B. Will point to the north pole end of the coil
- #40 Electrical resistance is measured with:
- A. An ohmmeter
- #41 The sum of all voltage drops around a simple DC circuit, including the source, is:
- A. Zero
- #42 If a resistance to which a constant voltage is applied is halved, what power dissipation will result?
- A. Doubled
- #43 The diameter of a conductor six inches long is doubled, what will be the effect on the resistance?
- Both of these!
- A. One-fourth the original value
- C. The resistance varies inversely with the cross-sectional area of the conductor
- #44 A minute subdivision of matter having the smallest known unit of negative electrical charge is:

- A. Electron
- #45 Conductors differ from nonconductors, i.e.:
A. There are a large number of free electrons in a good conductor
B. There is a small number of free electrons in a non-conductor
- #46 Direction of flow of DC electricity in a conductor can be determined by:
A. A magnetic compass and the left hand rule
C. Connecting an ammeter with marked polarities in series with the circuit
- #47 The difference between electrical power and electrical energy is:
A. Electrical power is the rate of doing work by electricity
B. Electrical energy is the ability to accomplish work by electricity
- #48 A positive temperature coefficient means:
A. Resistance increases as the temperature increases
B. Resistance decreases as the temperature decreases
- #49 A liquid which is capable of conducting electricity, but undergoes decomposition while doing so is:
A. An electrolyte
- #50 The effective value of an RF current and the heating value of the current are:
A. The same
- #51 One horsepower is:
A. 746 Watts
B. Roughly 3/4 kilowatt
C. Corresponds to lifting 550 pounds at the rate of one foot per second
- #52 What factors determine the heat generated in a conductor?
A. It is directly proportional to the resistance
B. It is directly proportional to the square of the current
- #53 What is the ratio of peak to average value of a sine wave?
A. 1.57 to 1
B. 1 to 0.636
[Misleading question, as $1/0.636 = 1.57$]
- #54 When the current sine wave in a circuit reaches its peak value before the voltage wave:
A. It is said to have a leading power factor
- #55 An "harmonic" is:
A. A whole multiple of an original frequency
- #56 Assuming a power source to have a fixed value of internal impedance, maximum power will be transferred to the load when:
A. The load impedance equals the internal impedance of the source
- #57 When two sine waves of the same frequency do not reach their maximum or minimum values simultaneously:

- A. A phase difference exists
- C. The ~~sign~~ sine waves are out of phase

#58 Which method may be used to obtain more than one value of voltage from a fixed DC source?

- A. Use a resistance type voltage divider
- B. Connect voltage regulator tubes of suitable values and tap off the desired output voltage

#59 The conductance (G) of a circuit if 6 A flows when 12 VDC is applied is:

- A. 0.5 mho

#60 Two 10 W, 500 ohm resistors in parallel will dissipate how many watts?

- A. 20 watts

#61 A 20 ohm resistor with a current of 0.25 A passing through it will dissipate how many watts?

- D. 1.25 watts

#62 If the voltage to a circuit is doubled and the resistance is increased to three times the original value, what will be the final current?

- B. $\frac{2}{3}$ the original current

#63 If a vacuum tube with a filament rating of 0.25 A and 5 V is operated from a 6 volt battery, what value of resistor is necessary?

- A. 4 ohms

#64 The minimum power dissipation rating of a resistor of 20,000 ohms across a potential of 500 V should be:

- A. 25 watts

[Official answer is wrong! Because $500^2 / 20k = 12.5W$]

#65 The total power dissipation capability of two 10 watt, 500 ohm resistors connected in series is:

- A. 20 watts

#66 What is the total power dissipation capability of two 10 watt 500 ohm resistors connected in parallel?

- A. 20 watts

#67 What is the maximum current carrying capacity of a resistor of 5000 ohms, 200 watts?

- A. 0.2 A

#68 What is the total resistance of a parallel circuit consisting of a 10 ohm branch and a 25 ohm branch?

- D. 7.14 ohms

#69 The current through two resistors in series is 3A. Resistance #1 is 50 ohms, resistance #2 drops 50 V across its terminals. What is the total voltage?

- A. 200 V

#70 An 18 ohm and a 15 ohm resistor are connected in parallel; a 36 ohm resistor is connected in series with this combination; a 22 ohm resistor is connected in parallel with this total combination. The total current is 5A. What current is flowing in the 15 ohm resistor?
A. 0.908 A

#71 A circuit passes 3A. The internal resistance of the source is 2 ohms. The total resistance is 50 ohms. What is the terminal voltage of the source?
A. 150 V

#72 A relay coil has 500 ohms resistance, and operates on 125 mA. What value of resistance should be connected in series with it to operate from 110 VDC?
A. 380 ohms

#73 Given: Input power to a receiver is 75 watts. How much power does the receiver consume in 24 hours of continuous operation?
A. 1800 watthours
B. 1.80 kilowatthours

#74 The total reactance when two capacitances of equal value are connected in series is:
B. The sum of the two individual reactances in ohms

#75 A capacitor's charge is stored:
A. Upon the inner surface of the capacitor plates
B. As an electrostatic field which exists in the space between the plates

#76 The voltage drop across an individual capacitor of a group of capacitors connected in series across an AC source is:
A. Inversely proportional to the ratio of the capacitance of the capacitor being considered
B. Inversely proportional to the total capacitance of the combination
C. Directly proportional to the applied voltage across the series combination

#77 What is the total capacitance of the capacitors of 3, 5, and 7 microfarad connected in series?
B. 1.479 microfarad

#78 If capacitors of 3, 5, and 7 microfarad are connected in parallel, what is the total capacitance?
A. 9 microfarad

[Official answer is wrong! As $3+5+7 = 15\mu\text{F}$]

#79 How many capacitors of 400 volts and 2 microfarad each would be necessary to obtain a combination rated at 1600 volts and 1.5 microfarad?
B. 12

#80 If a turn in an inductor is shorted:
A. There will be an decrease of induction
B. There will be a decrease of Q
C. There will be overheating with possible burnout

[Answer 'C' is open to dispute.]

- #81 The relationship between the number of turns and the inductance of a coil may be expressed by:
- A. The inductance varies approximately as the square of the number of turns
- #82 The formula for determining the resonant frequency of a circuit when the inductance and capacitance are known is:
- A. $f = 1/(2 \pi \text{ times the square root of } LC)$
- B. $f = 0.159/(\text{the square root of } LC)$
- #83 The formula for determining the wavelength when the frequency is known is:
- A. Wavelength = $300,000 / f \text{ kHz}$
- B. Wavelength = $300,000,000 / f \text{ Hz}$
- C. Wavelength = $300 / f \text{ MHz}$
- #84 The wavelength of the period of one complete cycle of a radio wave of 0.000,001 second is:
- A. 300 M
- #85 The efficiency of a radio device is:
- B. The ratio of the useful power output to the power input
- #86 What is the total impedance of a parallel capacitor and inductor with equal values of reactance?
- B. Zero total reactance
- C. Parallel impedance is resistive and infinite
- #87 The total inductance of two coils in parallel without any mutual coupling is:
- A. Equal to the product of the two inductances divided by their sum
- #88 What is the total reactance of a series AC circuit, with no resistance and equal inductance and capacitive reactances?
- A. The two reactances cancel being equal and opposite
- B. Net impedance is purely resistive and contains no reactive component
- C. The total reactance is zero at the resonant frequency
- #89 The total inductance of two coils in series without any mutual coupling is:
- A. The sum of the individual inductances
- #90 One wave-length is:
- A. The distance a wave will travel in the time for one cycle
- B. Centimeter wavelength = $30,000 / \text{frequency MHz}$
- #91 In an AC circuit, a series inductance acting alone:
- A. Causes the current to lag the applied voltage by 90 degrees
- #92 Shock excitation into an L-C circuit is the result of:
- A. A voltage being momentarily introduced
- B. The capacitor may be charged
- C. The inductor may have a voltage induced
- #93 The term cathode ray usually applies to:

- A. A fairly high velocity electron beam
- #94 Shielding an RF inductance:
 - A. Increases the losses of the inductance
 - B. Lowers the inductance value and the Q
 - C. Increases the coil capacity to the shield
- #95 The tendency of a tank circuit to keep oscillating for a time after the excitation energy has been removed is:
 - B. Flywheel effect
- #96 Power factor is defined as:
 - A. The ratio between the resistance and the impedance in a circuit
 - B. The ratio between the true power and the apparent power of a circuit
- #97 High or low frequency oscillations occurring in circuits other than the original tank desired output frequencies are:
 - B. Parasitic oscillations
- #98 What are effects of parasitic oscillations?
 - A. Change of bias
 - B. Reduced efficiency of the amplifier tube
 - C. Distortion of the modulated wave
- #99 The velocity of propagation of radio frequency waves in free space is:
 - A. 300,000 ~~meters~~ km / second
 - B. 186,284 miles / second
 - C. The same as the velocity of light in free space
- #100 To double the frequency of a resonant circuit:
 - B. Make L and C both half their original values
- #101 How may the Q of a parallel resonant circuit be increased?
 - A. Increasing coupling to the resonant circuit
 - B. Using coil and capacitor supports of special low - loss materials
- #102 If L and C in a parallel resonant circuit resonants at 1000 kHz are so varied that their product remains constant, what will be the resulting resonant frequency?
 - C. 1 MHz
- #103 What is the resonant frequency of a tuned circuit consisting of a 500 picofarad capacitor, a 150 microfarad tuning coil, and 10 ohms resistance?
 - A. 581 kHz
- #104 What is voltage regulation as applied to power supplies?
 - A. The ratio of change in voltage between no load and full load to the full-load voltage output
- #105 An EMF may be generated by sound waves by what principle?
 - A. Electrostatic
 - B. Piezo-electric

C. Resistance change

#106 How can you correct power factor in an electrical circuit?

- A. Inductance is used to correct a leading angle
- B. Capacitance is used to correct a lagging angle

#107 Permeability is:

- B. The ratio of magnetic flux density in a substance to the magnetizing force which produces it

#108 The time in seconds for a capacitor to attain 63.2 % of the applied voltage across its terminals is:

- C. Time constant

#109 What is the reactance of a 2-henry choke at 3000 Hz?

- B. 37,680 ohms

#110 If there is no resistance in either leg of a circuit with an inductance of 5 henrys in parallel with a capacitance of 1 microfarad, what is the equivalent impedance of the parallel network circuit?

- B. Infinite

[Can't really be calculated, as frequency is not given.]

#111 What is the total impedance of a series AC circuit having a resistance of 6 ohms, an inductive reactance of 17 ohms, and zero capacitive reactance?

- C. 18 ohms

#112 The total impedance of a series AC circuit with an inductive reactance of 24 ohms, a resistance of 16 ohms, and a capacitive reactance of 16 ohms is:

- B. 16 ohms

[Wrong! Since $Z=16+24i-16i$, $|z| = \sqrt{16^2 + (24-16)^2} = 17.89 \text{ ohm}$]

#113 Essentials for making a good solder connection are:

- A. *Bright, clean parts*
- B. *Plenty of heat with the minimum amount of solder used*
- C. *Discontinue operating on high power*
- D. **None of the above**

[Distractions mislead here]

#114 For protection of personnel handling a transmitter:

- A. Ground all exposed metal parts

#115 The ratio of peak-to-effective voltage values of a ~~sign~~ sine wave are:

- A. 1.414 to 1
- B. 1 to 0.707

#116 The opposition to the creation of magnetic lines of force in a magnetic circuit is known as:

- A. Reluctance

#117 The ratio of magnetic flux density to the field strength is known as:

B. Permeability

#118 The magnetic force which remains in a substance after the original magnetizing force has been removed is known as:

B. Residual magnetism

#119 The direction of electron flow through a coil and the manner of winding the turns:

A. Influence the direction of magnetic line of force generated by an electromagnet

#120 Adding an iron core to an air-core inductance:

A. Increases the inductance

#121 Electromagnets are used in:

A. loudspeakers

B. meters

C. motors

#122

What will be the effect of a small increase in the number of turns upon the field strength of a single layer solenoid?

A. Decrease in field strength if the coil length is increased

B. Unchanged if the spacing is reduced to keep the length constant

#123 Can a transformer be used with direct current?

A. In general, no

B. If the DC current is periodically interrupted it would be possible to use an original DC voltage source

[Answer 'B' open to dispute]

#124 A tube containing either a filament or cathode structure, grid, and a plate is a:

A. Triode

#125 A tube similar to a triode with the addition of a spirally wound screen grid between the plate and control grid is a:

B. Tetrode

#126 Theoretical gain of a tube. The ratio of a small change in plate voltage to give a certain small change in plate current to a change in grid which would cause the same current:

A. Amplification factor

[Question phrased confusingly.]

#127 Effectiveness of the grid in causing changes of plate current:

A. Transconductance

B. Mutual conductance

#128 The maximum negative anode voltage with respect to the cathode. It equals the DC voltage at the input ~~to the~~ plus the peak AC voltage applied during the nonconducting portion of the cycle of operation of the tube:

A. Maximum inverse plate voltage

#129 What is the primary purpose of the control grid of the triode?

A. To provide a means of obtaining amplification

#130 What is the primary purpose of the screen grid of the tetrode?

A. Reduces the grid to plate capacitance, making it unnecessary to neutralize RF amplifiers except at very high frequencies

B. Makes the plate current substantially independent of plate voltage, permitting much higher values of amplification

#131 What is the primary purpose of the suppressor grid of a pentode?

A. Is highly negative with respect to the plate and returns secondary emission to the plate, increasing the permissible gain and the tube efficiency

#132 Thoriated tungsten is usually used to make:

A. Filaments

#133 In what types of circuits do beam power vacuum tubes find application?

A. As audio amplifier in the output and power stages of circuits having low to moderately high output ratings

B. As an RF power amplifier

#134 When free electrons in a conductor acquire sufficient energy to leave the conductor and pass into the surrounding space, it is expressed as:

B. Electron emission

#135 The emission of electrons from a material due to the impact of high-velocity electrons on its surface is:

B. Secondary emission

#136 Characteristics of a vacuum tube operating as a class A amplifier:

A. Low plate circuit efficiency, about 25%; practically no grid driving power; plate current flowing for 360 degrees of each cycle; practically no distortion of the output waveshape

#137 Characteristics of a vacuum tube operating as a class B amplifier:

B. Plate circuit efficiency, about 50-60%; plate current flows slightly more than 180 degrees of each cycle, medium power output

#138 Factors which determine **bias** voltage of a vacuum tube:

A. Class of operation, plate supply voltage, permissible distortion

B. Grid signal magnitude, permissible plate dissipation, desired amplification factor

C. The no-signal plate current desired, the desirability of drawing grid current

#139 In the usual Class A amplifier:

A. There is no grid current

#140 The DC bias in a Class A amplifier:

A. Usually is negative as measured at the grid with respect to cathode

#141 What is the effect of incorrect grid bias in a Class A amplifier?

A. Distortion of the output waveshape

B. Possible excessive plate dissipation if the bias is too low

- #142 The approximate efficiency of a Class A vacuum tube amplifier:
A. 20%-30%
- #143 The approximate efficiency of a Class B vacuum tube amplifier:
B. 60%
- #144 The approximate efficiency of a Class C vacuum tube amplifier:
C. 85%
- #145 A charge due to the accumulation of negative electrons because the plate potential cannot attract all of the electrons leaving the emitter:
B. Space charge
- #146 A material flashed by the application of heat after the tube is evacuated that absorbs any gases remaining inside the tube:
B. Getter
- #147 What types of vacuum tube filaments are reactivated:
B. Thoriated tungsten
- #148 A tungsten filament is operated at _____ temperature than a thoriated tungsten filament:
A. A higher
- #149 The presence of gas within a tube is indicated:
A. By a blue glow
- #150 The cathode of an indirectly heated type of vacuum tube should be maintained at nearly the same potential as the heater circuit:
A. To reduce hum pickup into the cathode
B. To prevent breakdown of the insulation between the heater and cathode
- #151 Transmitting tube filaments should be maintained at recommended voltages:
A. To realize the greatest life-expectancy
B. If the filament voltage is too low, the emission will be reduced and operation of the circuit may be adversely affected
C. If the voltage is too high, the filament may burn out
- #152 Use of an AC filament supply is desirable:
A. Mostly for practical reasons. It is easily obtainable
- #153 If a DC filament supply is used, it is advisable to periodically reverse the polarity of the filament potential:
A. To lengthen the life of the filament
- #154 Bias voltage on the grid of an AF amplifier tube:
A. Determines the operating conditions of the tube
B. The correct value is essential for undistorted Class A output
C. In power amplifiers the plate current must be limited to safe value not to exceed the rated plate dissipation of the tube

- #155 The screen grid in a vacuum tube:
A. Makes it unnecessary to neutralize RF amplifiers except at very high frequencies,
B. Makes it possible to obtain much higher values of amplification than with triodes
- #156 The suppressor grid in a multielement vacuum tube:
A. Is highly negative with respect to the plate
B. Returns secondary electrons to the plate
C. Increases the permissible gain and the efficiency of the tube
- #157 The gain of a triode audio amplifier is a function of:
A. Tube transconductance
B. Plate load impedance
C. Transformer step-up (if used)
- #158 "Load" on a vacuum tube commonly refers to:
A. The impedance through which plate current flows to produce a useful output
B. Increases as the load impedance approaches the internal plate impedance in value
- #159 A case in which the grid is held at an excessively negative value for a period of time thereby cutting off plate current:
A. Blocked grid
[More commonly called 'Grid Blocking']
- #160 The maximum power that can be safely and continuously dissipated in heat on the plate:
A. Maximum plate dissipation
- #161 Occurs when plate current equals electron emission for any given filament or cathode temperature:
A. Plate saturation
- #162 The most desirable factor in the choice of a vacuum tube for a voltage amplifier:
B. A high value of transconductance
- #163 Lack of requirement for neutralizing, except at ultra high frequencies, is an advantage of a tetrode over ____:
A. A Triode
- #164 Characteristics of a vacuum tube operating as a Class C amplifier:
C. High plate circuit efficiency, up to 80%; plate current drawn in bursts; great distortion of output waveshape
- #165
Plate current flows for less than 180 degrees (about 120 degrees when the grid bias is about twice cutoff value) in what class amplifier?
C. Class C
- #166 Tubes operated as Class C amplifiers are not suited for audio-frequency amplifiers:
A. Because of excessive distortion
- #167 Low plate current may be caused by:
A. Low filament emission and voltage

- B. Excessive bias value, shorted screen by-pass capacitor
- C. Open grid circuit, low screen grid supply voltage

#168 A tuned circuit made up of inductance and capacitance is:

- A. An oscillator

[Really only just a part, not the whole.]

#169 Some radio-frequency amplifiers must be neutralized:

- B. To prevent sustained oscillations from occurring in the amplifier

#170 Cavity resonators are:

- A. A form of resonant tank circuit
- B. Consist of a hollow metal cylinder bead on all sides
- C. Have a very high Q and selectivity

#171 The diode detector:

- A. Is square law on weak signals
- B. Is practically linear on strong signals

#172 The functioning of a grid-leak detector:

- A. Depends on the ability of the grid leak and capacitor to follow the average grid current variations which are directly proportioned to the modulation envelope
- B. Depends on second harmonic distortion

#173 Characteristic of a square law type of vacuum tube detector:

- A. High sensitivity is provided due to the audio output signal amplitude being proportioned to the square of the radio frequency voltage
- B. High percentage of second harmonic distortion
- C. Works on weak signals only

#174 A diode detector ordinarily produces _____ overall distortion of the audio output wave than does a triode detector:

- A. Lower

#175 Operating conditions for determining that a tube is being used as a power detector:

- A. Bias at about cutoff
- B. High input grid resistance
- C. Plate circuit rectification

#176 Why is a center ~~tap~~ **tap** usually provided for vacuum tube plate and grid return circuits when an AC filament supply is used?

- A. To prevent hum voltage from modulating the normal signals

#177 How would you determine the cathode-bias resistance necessary to provide correct grid bias for an amplifier?

- A. Bias equals the IR drop across the cathode
- B. Bias is found by dividing the desired DC bias voltage by the total no-signal cathode current
- C. For a tetrode or pentode, the screen current must be added to the plate current

#178 Given the following vacuum tube constants: $G_p = 1000 \text{ V}$, $I_p = 150 \text{ mA}$, $I_g = 10 \text{ mA}$, Grid leaks = 5000 ohms. What would be the grid bias voltage?

A. 50 V

#179 What currents will be indicated by a milliammeter connected between the center ~~top~~ tap of the filament transformer of a tetrode and negative high voltage?

C. Combined plate and screen grid currents

#180 A dynatron oscillator is a _____ which depends upon the negative resistance characteristic of a tetrode tube for its operation:

A. Tuned circuit operation

[Wording of question lacks sense.]

#181 Materials which can be used as crystal detectors:

A. Silicon, galena

B. Carborundum, iron pyrites

C. Silicon, iron pyrites

#182 A power detector may be operated:

C. As either a square law detector or a linear detector

#183 Used to multiply the fundamental frequency by two:

A. Frequency doubler

#184 When used as an RF amplifier, a pentode vacuum tube:

A. Usually does not require neutralization

#185 A quartz crystal in a radio transmitter:

A. Is used to provide a high degree of master-oscillator frequency stability

B. May be the sole tuned circuit in the oscillator

#186 Advantage of crystal control over tuned circuit oscillators:

A. Very high Q

B. Compact size

C. Excellent frequency stability

#187 If the crystal will undergo very small changes in its operating frequency with relatively large temperature variations:

B. A low-temperature coefficient crystal

#188 A separate source of power is sometimes desirable for crystal-oscillator units in a transmitter:

A. To prevent dynamic instability of the crystal oscillator

#189 "The temperature coefficient of an x-cut crystal is negative":

B. The operating frequency of the crystal will decrease as the temperature increases

C. The operating frequency of the crystal will increase as the temperature decreases

#190 If you apply DC voltage to the opposite plane surfaces of a quartz crystal:

A. The crystal plate will always undergo a physical distortion

B. The crystal might crack under the strain of displacement caused by too much voltage

- #191 "The temperature coefficient of a y-cut crystal is positive" means:
A. The operating frequency of the crystal will decrease as the temperature decreases
B. The operating frequency of the crystal will increase as the temperature increases
- #192 Two dissimilar metals joined together and producing a current between them when the junction is heated is:
B. A thermocouple
- #193 Waveguides:
A. A type of transmission line
B. Hollow rectangular or circular pipe
C. ~~Fine~~ Find application as transmission lines
- #194 Transistors may be compared to a conventional triode vacuum tube functionally:
A. Emitter corresponds to the cathode
B. Collector corresponds to the plate
C. Base corresponds to the grid
- #195 Types of transistors:
A. Point-contact
B. Junction
- #196 When using and storing crystal microphones:
A. They should be protected from shock and vibration
B. They should be protected from humidity
C. They should be protected from high temperatures
- #197 What effect does a change in the dielectric constant of a capacitor dielectric material have upon the capacitance of a capacitor:
A. Capacity varies directly with the dielectric constant
- #198 Increasing the number of plates of a capacitor:
A. Will increase the capacitance
- #199 If the dielectric constants of a capacitor dielectric material between the capacitor plates were changed from 1 to 1:
A. The capacitance would be twice its original value
[Question improperly worded.]
- #200 Contacts which slide together on opening and closing:
B. Are known as self-wiping
C. Keep the contacts clean by their action
- #201 Permanent magnets used in head telephones:
A. Place the diaphragms under tension so that the sensitivity of the telephones will be increased
B. Improve the frequency response
C. Prevents production of second harmonics in the telephones

- #202 Emergency repairs to an inductance coil having burned or charred insulation:
A. Are generally impractical, short of rewinding the coil with good wire
- #203 Indications of a defective vacuum tube in a transmitter:
A. Gas ~~blow~~ glow within the tube, excessive plate color due to overheating
B. No light from the filament, insufficient plate current, reduced output
C. Excessive plate current, possible internal arcing, fluctuating plate or grid current
- #204 The breakdown voltage rating of a capacitor are determined by:
A. The type of dielectric material used
B. The thickness of the dielectric material
- #205 Crystal surfaces should be free of dirt ~~of~~ or grease to operate properly:
A. Do not touch the faces of the crystal with the fingers
B. Clean the faces with soap and water
C. Clean the faces with carbon tetrachloride
- #206 A purplish glow from within a tube indicates:
A. A soft tube
C. Air or undesired gases within the tube
- #207 Given a solenoid with a resistance of 5 ohms and ~~0.34~~ 0.34A through the winding when ~~1108~~ 1108V at 60 Hz is applied. What is the impedance?
A. ~~367~~ 376 ohms
[Can't be calculated. Units missing. If 0.34A and 1108V, then impedance is 376 ohms.]
- #208 Use of a low pass filter network:
A. Ripple filter in power supplies, harmonic suppression filters in antenna systems
B. Line noise filters, tone control systems
C. Crossover networks, output filters of detector circuits
- #209 A special type of power supply filter choke whose inductance is inversely proportioned to values of DC within specified limits is:
B. Swinging choke
- #210 The best suited material for use as an antenna strain insulator exposed to the elements:
A. Glazed porcelain
- #211 Materials frequently used for relay contacts:
A. Tungsten
B. Silver
C. Gold
- #212 Why is rosin used as a soldering flux?
A. It is noncorrosive
B. It allows a perfect soldering bond to be made
C. It possesses good insulation qualities
- #213 What substance is the most widely used in crystal oscillators?
A. Quartz

- #214 Why is an oscillator crystal operated at a constant temperature?
 B. To maintain a constant frequency output from the oscillator
- #215 The advantage of a single-button carbon microphone:
 A. High output voltage
 B. Sensitivity
 C. Low cost
- #216 A carbon microphone should not be:
 A. Jarred while in operation
 B. Tapped while in operation
 C. Subjected to violent sound intensities
- #217
 A
 In connecting ~~head-telephones~~ **headphones** directly in the plate circuit of a vacuum tube one should observe the proper polarity:
 A. To maintain maximum sensitivity in the headphones
- #218 What should the plate current do in the operation of a Class B audio amplifier?
 A. Fluctuate
- #219 What turns ratio does a transformer need to match a source impedance of 500 ohms to a load of 10 ohms?
 A. 7.1 to 1
- #220 What microphones have a high impedance output?
 A. Crystal
 B. Dynamic
 C. Any **of the above.**
- #221 How may low impedance (75 ohm) ~~head-telephones~~ **headphones** be connected to the output of a vacuum tube?
 A. By using an impedance matching transformer in the output stage
 B. Connect them as a cathode bias resistor in the output stage
 C. Either A or B
- #222 Why do headphones usually have high-impedance windings?
 A. They can usually be operated without an impedance matching transformer
 B. They represent a closer match to the plate load impedance for the tube delivering necessary driving power than low impedance planes
- #223 A "choke" coil:
 A. Offers a relatively high impedance to AC currents
 B. Has a high "Q" (low RF losses)
 C. Offers a low resistance to DC currents
- #224 Why is correct grid bias necessary for audio frequency amplifier?
 A. To minimize distortion
 B. To set the operating conditions for determining the class of amplifications
 C. So as not to exceed the rated plate dissipation of the tube

#225 When a tube is used as a Class B amplifier what portion of the excitation voltage cycle does plate current flow?

A. Slightly more than 180 degrees

#226 A properly operated Class A audio amplifier:

A. Produces no serious modification of the input waveform

#227 What is the main advantage obtained by using two triodes in push-pull in a Class A audio frequency amplifier?

A. Increased power output

B. Cancellation of even harmonic distortion in the output

C. Elimination of DC saturation, elimination of cathode by-pass capacitor

#228 What is the maximum permissible RMS value of audio voltage which can be applied to the grid of a Class A audio amplifier which has a grid bias of 10 V?

A. 7.07 V

#229 Distortion in a Class A amplifier can be caused by:

A. Insufficient plate and screen potentials, incorrect grid bias, defective ~~rube~~ tube

B. Leaky or shorted input coupling capacitor

C. Excessive ~~amplitude~~ amplitude if grid signal, incorrect value of load impedance

#230 Vacuum tubes operating as Class A amplifiers may be used as:

A. Audio power amplifiers, audio voltage amplifiers, microphones amplifiers, line amplifiers

B. Oscilloscope amplifiers, modulators

C. Phonograph amplifiers

#231 Why is a push-pull audio frequency amplifier preferable to a single-tube stage?

A. When compared with a single-tube stage, power output is doubled

#232 What is the DC plate voltage of a resistance-coupled amplifier ~~state~~ stage with a plate-supply voltage of 260 V, a plate current of 1 mA, and a plate load resistance of 100,000 ohms?

A. 160 V

#233 Why is it necessary to use two tubes in a Class B audio amplifier?

A. To prevent the excessive distortion which would result from the use of only one tube in Class B

#234 If the coupling capacitor leaked in a resistance-coupled audio frequency amplifier:

A. Excessive plate current would result

B. A large value of grid current would result

C. There would be extreme distortion, and very low gain

#235 A vacuum tube operated Class C audio amplifier is not feasible, either in single or push-pull:

A. Since the plate current only flows 120 degrees, even in push-pull, only 2/3 of the cycle is reproduced and the resultant distortion would be unacceptable for audio

B. Tank circuits, which replace the missing portions of the cycle, can't be used in an audio amplifier because they only operate on one frequency

- #236 Even harmonics may be reduced in the output of an audio frequency amplifier:
- A. By operating the state push-pull
 - B. In a single tube amplifier, by operating the stage only on the linear part of the tube's characteristic curve
- #237 The main advantage of a tuned audio frequency amplifier in a receiver used for the reception of CW:
- A. A reduction in interference from unwanted signals
- #238 Decoupling networks in the plate circuit of a multistage audio amplifier:
- A. Prevents oscillations from occurring in the amplifier
- #239 An audio-transformer is seldom used as the output device in the plate circuit of a tetrode audio-amplifier stage:
- A. Because an ordinary transformer cannot supply enough impedance to the plate circuit
- #240 The chief advantage of Class A audio operation is compared to the other classes of audio-frequency amplifiers:
- B. Low distortion of the output signal
- #241 Which is not the principle advantage of transformer coupling compared to resistance coupling in audio-frequency amplifiers?
- D. A transformer is expensive, heavy, and bulky
- #242 Efficiency of a power transformer is determined by:
- A. Eddy current losses
 - B. Hysteresis losses
 - C. Copper losses
- #243 The ratios of primary and secondary currents in a power transformer:
- A. Are approximately in inverse ratio to the turns ratio
 - B. Is to some extent affected by the diameter of the primary and secondary wire
 - C. The current ratio is in inverse proportion to the voltage ratio
- #244 A transformer has a primary voltage of 100, primary turns = 200, and secondary turns = 40. What is the secondary voltage?
- A. 20 V
- [100V * 40/200 = 20V]**
- #245 What factors determine the no-load voltage ratio of a power transformer?
- B. Turns ratio
- #246 The turns ratio of a transformer varies:
- A. As the square root of the impedance ratio
- #247 Primary cells:
- B. Cannot be recharged
 - C. An attempt to recharge it would not restore the eroded electrode
 - D. B & ~~D~~ C
- [Obvious typo]**

- #248 Secondary cells:
A. Can be recharged
C. The products of the chemical change are not soluble in the electrolyte
- #249 The formation of hydrogen gas around the positive electrode of a primary cell is:
B. Polarization
- #250 A dry cell may be tested:
A. Must be tested under normal load condition
C. May be taken by any conventional voltmeter
- #251 In the usual type dry cell:
A. The negative electrode is made of zinc
B. The positive electrode is made of carbon
- #252 "A", "B", and "C" batteries are alike, but specifically constructed for a particular function. Explain:
A. "B" battery is for plate and screen power
B. "C" battery for grid bias voltage
C. "A" battery for filament power
- #253 The condition of a dry "B" battery may be determined:
A. By measuring the voltage under normal load
C. A loss of 20 % of the voltage under normal load indicates that the battery should be replaced
- #254 Spare "B" batteries should be stored:
A. In a dry place
- #255 A means of comparing the weight of a volume of liquid with the same volume of distilled water:
A. Specific gravity
- #256 Edison type batteries:
A. Have plates ~~up~~ of nickel
B. Have plates of iron
C. Have plates of compounds of nickel and iron
- #257 The electrolyte of a lead-acid storage cell:
B. Dilute sulfuric acid
C. Has a specific gravity about 1.3 fully charged
- #258 The negative plate of a lead-acid storage cell:
A. Is composed of pure spongy lead
- #259 The positive plate of a lead-acid storage cell:
B. Is composed of lead peroxide
- #260 The chemical composition of the electrolyte in an Edison-type storage cell:
A. Is contained in a nickel-plated sheet steel tank

- B. Has a specific gravity of about 1.200
- C. Is a 21% solution of potassium and lithium hydroxides in distilled water
- #261 The negative plate of an Edison-type storage cell is:
 - A. Finely powdered pure iron
- #262 The positive plate of an Edison-type storage cell is:
 - B. Green oxide of nickel
- #263 The average fully-charged voltage of an Edison storage cell is:
 - A. 1.2 V
- #264 Decrease in capacity of an Edison-type storage cell can be caused by:
 - A. Frequent overheating, and operating conditions over 115 degrees fahrenheit
 - B. Charging at less than the normal rate
 - C. Adding impure water to the electrolyte, or a weak or aged electrolyte
- #265 The average fully charged voltage of a lead-acid cell is:
 - C. 2.06 V
- #266 To increase the power output of a storage cell:
 - A. Low internal resistance is desirable
- #267 The condition of charge of an Edison cell can be determined:
 - A. By reading the terminal voltage under load
 - B. By checking the voltage against a standard discharge curve
- #268 The charge of a lead-acid storage cell:
 - A. May be determined by hydrometer readings
 - B. By measuring voltage under a heavy load
- #269 Sulfation:
 - A. Reduces terminal voltage
 - B. Increases internal resistance
 - C. Reduces power output
- #270 If the polarity is reversed when charging a storage cell:
 - A. No damage in a lead-acid cell unless excessive
 - C. No damage in an Edison-cell if temperatures below 115 degrees Fahrenheit
- #271 You may measure the voltage of a battery under heavy load:
 - A. To determine its condition of charge
- #272 If the voltage of some cells in a battery are found to be reversed, what is indicated?
 - A. Polarity was reversed while charging
- #273 Distilled water should be added to a lead-acid storage cell:
 - A. To keep the electrolyte 1/4 inch above the top of the plates
 - B. To keep the useful plate area sufficient to maintain the full capacity of the cell
- #274 Local action in a lead-acid storage cell:

- A. Causes a slow discharge in the cell
 - B. Forms a very hard sulfate on the plates
 - C. May be reduced by trickle charging when the battery is not in actual use
- #275 To maintain a group of storage cells in good operating condition:
- A. Observe correct charge and discharge rates
 - B. Overcharge about once a month to remove sulfation
 - C. Keep all terminal connections clean and tight
- #276 What may cause the plates of a lead-acid cell to buckle?
- A. Excessive sulfation
 - B. Overheating
 - C. Overdischarging of the battery
- #277 What may cause sulfation of a lead-acid cell?
- A. It is a normal process
 - B. Overdischarging
 - C. Local action with improper charging
- #278 What may be used to neutralize an acid electrolyte?
- A. Ammonium hydroxide
 - B. Baking soda
 - C. Washing soda
- #279 To prevent corrosion of battery terminals:
- A. Occasionally clean and coat them with Vaseline or other suitable lubricants
- #280 Why should there be ventilation to the room housing a large group of storage cells?
- A. To prevent gas accumulation
 - B. To prevent overheating
- #281 Radio equipment on which electrolyte may be used:
- A. Electrolyte capacitor
 - B. Electrolyte rectifier
 - C. Electrolyte detector
- #282 What is the effect of low temperature on the operation of a lead-acid storage battery?
- A. Electrolyte may freeze and split the battery if sg too low
 - B. The capacity is decreased
- #283 What form of energy is stored in a lead-acid storage battery?
- A. Chemical
- #284 How may polarity of a storage battery be determined?
- A. Voltmeter
 - B. Salt water method **[More bubbles form on the negative wire.]**
- #285 A battery with a terminal voltage of 12.5 V is to be trickle-charged at a 0.5 A rate. What resistance should be connected in series with the battery to charge from a 110 V line?
- A. 195 ohms
- [$110V - 12.5V = 97.5V$. That divided by 0.5A gives 195Ω]**

#286 A discharged storage battery of 3 cells has an open circuit voltage of 1.8 V per cell and an internal resistance of 0.1 ohm per cell. What voltage is needed to give an initial charging rate of 10 A?

A. 8.4 V

[$10\text{ A} \times 0.3\Omega = 3\text{ V}$. That plus $3 \times 1.8\text{ V}$ gives 8.4V]

#287 What capacity in amperes of storage battery is required to operate a 50 W emergency transmitter for 6 hr.? Assume a continuous transmitter load of 70% of the key-locked demand of 40 A, and an emergency light load of 1.5A.

A. A battery rated greater than 177 amperhours

B. A battery rated at least 177 amperhours

[70% of 40A = 28A. That plus 1.5A for lights gives $29.5\text{ A} \times 6\text{ hours}$ for 177 A-hrs.]

#288 If a receiver storage A battery could not be kept charged, and maintain the required watch period, what should you do?

A. Increase the charging rate

#289 Abnormally low input power terminal voltage of a lifeboat radiotelegraph transmitter while in operation could be caused by:

B. Excessive overload

C. A partially discharged battery

#290 If a battery has 12.4 V on open circuit and 12.2 V when its charging circuit is closed:

A. Could have polarity reversed

#291 The tops of lead-acid batteries should be kept dry:

A. To prevent slow discharge of the battery

C. To reduce the formation of terminal corrosion

#292 When lead-acid cells are subject to low temperatures they should be fully charged to:

A. To prevent freezing

B. To provide the maximum capacity

[Question truncated on test.]

#293 If an electrolyte in a lead-acid storage cell becomes low due to evaporation:

A. The level should be brought to about 1/4 inch above the tops of the plates with pure water

#294 An Edison storage battery should not be charged at less than the manufacturer's specified rate:

A. In order that the capacity of the battery shall be maximum after charge

B. The chemical reactions of the Edison-type cell

[Answer B truncated on test. Choose it with A nevertheless.]

#295 Your emergency battery has a specific gravity reading of 1.120. What should be done?

A. Place the battery on charge at once

B. Bring the electrolyte level to about 1/4 inch above the top of the plates

C. The battery will be fully charged when the specific gravity reads 1.280 to 1.300

#296 What care should be taken with selecting water to add to a storage cell?

A. It should be chemically pure or distilled

#297 If the circuit breakers refuse to stay closed when you place the emergency batteries on charge, what is the trouble?

- A. Internally shorted cells
- B. Reversed charging polarity
- C. Grounded circuit connections

#298 Heat developed within a storage cell under charge or discharge conditions is caused by:

- A. I^2R losses
- B. Energy transfer due to chemical reactions

#299 How would you connect a group of similar cells in a storage battery to obtain the maximum zero resistance current?

- A. In parallel

#300 How would you connect a group of similar cells in a storage battery to obtain the maximum ~~no-load~~ **no-load** output voltage?

- B. In series

#301 What current will flow in a 6 V storage battery with an internal resistance of 0.01 ohms, when a 3 W, 6 V lamp is connected?

- A. 0.4995 A

[With 3W and 6V, R is 12Ω. That plus 0.01Ω across 6V draws 499.5mA.]

#302 The charging rate of a storage cell charged from a fixed voltage source decreases as the charging progresses ~~opposition to the charging voltage?~~

- A. Because as cell voltages increase, offering more opposition to the charging voltage
- B. When the effective charging potential is reduced, the charging current is decreased

[Question has part of answer A pasted onto end]

#303 The principal function of the filter in a power supply:

- A. To remove the variations in amplitude of the rectifier output
- B. To provide a relatively unvarying DC voltage for use in the various circuits
- C. **Either A or B**

#304 Advantages of capacitor input and choke-input filters when used with rectifiers:

- A. Capacitor-input filter provides higher output voltage under reasonably light load conditions
- B. Choke-input filter offers better voltage regulations

#305 A high-resistance fixed resistor is shunted across each unit of a high voltage series capacitor bank in the power-supply filter circuit to:

- A. Insure that the correct voltage appears across each unit

#306 Part of the secondary winding of a transmitters power transformer is accidentally shorted. What should be the immediate effect?

- A. The current would rise to an excessive value and trip the circuit breaker

#307 Bleeder resistors are used in power supplies:

- A. To improve the output voltage regulation

- B. They also discharge the filter capacitor when the power is turned off
- C. **Either A or B**

#308 The ratio of the frequencies of the output and input circuits of a single-phase full-wave rectifier:

- B. 2 to 1

#309 A capacitor is sometimes placed in series with the primary of a power transformer:

- A. To improve the power factor

#310 What is the maximum allowable secondary voltage of a transformer used as a center-tapped full-wave rectifier with tubes having a peak inverse voltage rating of 10,000 V?

- A. 7070 V

[Actually 7072V, since $1.414 * 2 = 2.828$, and $10kV / 2.828 = 3536$, which doubled gives 7072V.]

#311 If a 60 Hz transformer is connected to a 120 Hz source of the same voltage:

- A. The impedance of the transformers would be greater
- B. The current would be reduced
- C. There would be a decrease in power delivered to the load

#312 If a 500 Hz transformer is connected to a 60 Hz source of the same voltage:

- A. The primary would draw excessive current
- B. The transformer would overheat
- C. The primary might burn out

#313

A 500 Hz AC plate supply, rectified by a full-wave, unfiltered rectifier circuit. What would the emission be?

- A. A modulated continuous wave of 500 Hz
- B. A modulated continuous wave of 1000 Hz
- C. A-2
- D. All of the above

[Actually wrong, since A and B exclude each other. Nevertheless...]

#314 The purpose of an air gap in a filter choke coil core. Which is the incorrect answer?

- A. To decrease the effective inductance for the AC component of current by increasing the DC saturation

#315 Loose laminations in a filter choke:

- C. Cause a buzzing or chattering sound

#316 Poor regulation in a power supply may be caused by:

- A. No bleeder resistance
- B. High resistance filter chokes
- C. Insufficient filter capacity

#317 Why should the case of a high-voltage transformer be grounded?

- A. To protect personnel handling the equipment from shock
- B. To prevent high static voltages building up between the case and grounds

- #318 When connecting electrolytic capacitors in series:
A. Observe the polarity marked on the component
- #319 Full wave rectification has _____ than half-wave:
A. Better output voltage regulation
B. Smaller filter components for a given ripple percentage
- #320 Voltage regulation is _____ with a high resistance choke:
A. Made worse
- #321 Electrolyte capacitors are desirable over other types because:
A. A large capacitance may be obtained with small physical dimensions
C. The wet-type electrolytic capacitor is "self-healing"
- #322 The most common values of chokes range from:
A. 5 H to 30 H
- #323 The power transformer and rectifier of a radio receiver are designed to supply a plate voltage of 250 V when operating from a 110 V 60 Hz supply, if the transformer is connected to 110 VDC what will happen?
A. The secondary would burn out
B. The primary would overheat and burn out
D. Either A or B
[Wrong, actually. While B is true, A is not. Nevertheless...]
- #324 A shunt-wound DC motor:
A. Has a practically constant speed under widely varying load conditions
- #325 A series DC motor has:
A. Maximum torque at low speed
B. Quick starting
C. Poor speed regulation under varying loads
- #326 This partially counteracts the line voltage and so limits the armature current in a DC motor:
B. Counter EMF
- #327
D
A compound-wound DC motor:
A. Has constant speed under changing load conditions
B. Low starting torque
C. High starting torque
D. A & B C
[Wrong, actually. B is false while instead C is true. Nevertheless...]
- #328 Laminated iron is used in armature and field construction to:
A. Reduce eddy current losses
B. Offer a number of high-resistance paths to Eddy currents
C. A or B

- #329 The _____ of a DC motor periodically change the armature coils to maintain one direction of rotation:
B. ~~Connector~~ **Commutator**
- #330 The speed of a series DC motor may increase and destroy the motor by centrifugal action:
A. When operated without a load
- #331 When the field of a shunt-wound DC motor opens while the machine is operating under no load:
A. The motor would race, and if unchoked, might destroy itself
- #332 _____ are used in a DC motor to reduce brush sparking without moving the brushes:
A. Interpoles
B. Commutating poles
C. Either A or B
- #333 A short in the armature coils of a DC motor causes:
C. Reduction of speed under load, and excessive armature current
- #334 The motor-field rheostat should be _____ when starting a DC motor generator set:
B. Minimum resistance in the field circuit
- #335 If a motor generator fails to start when the start button is depressed, the trouble may be:
A. Blown fuse or tripped circuit breaker
B. Open armature or motor-field rheostat
C. Broken connections, defective brushes
- #336 When increased output is desired from a motor-generator, what is the usual procedure?
A. Decrease the resistance ~~after~~ **of** rheostat in series with the generator field
- #337 A dynamotor is:
A. A combination motor-generator which utilizes a common field winding
B. Usually run by battery power
C. A higher efficiency than a motor-generator
- #338 Output voltage of a dynamotor may be regulated:
A. Only by changing the speed of the motor
B. A series resistance in the output line could be used to reduce the available output voltage
C. **Either A or B**
- #339 What disadvantage is there to a dynamotor?
D. Its output voltage is dependent on the source voltage stability
- #340 Causes of excessive sparking at the brushes of a DC motor or generator include:
A. Brushes not properly set at neutral point, dirt on commutator, motor overloaded
B. Weak spring tension on brushes, brushes worn, commutator worn eccentric
C. High mica-insulation between bars, commutator bars of uneven height
- #341 By-pass capacitors are often connected across the brushes of a high-voltage DC generator:

- B. To protect the generator winding from high voltage surges
- C. To reduce RF interference

#342 Causes of motor-generator bearing overheating include:

- A. Incorrect kind of lubrication, lack of ventilation
- B. Constant overload, dirt in bearings
- C. Misalignment

#343 RF interference may be minimized:

- A. By the use of brush by-pass capacitors
- B. Low frequency filters
- C. Shielding of long connecting leads

#344 Emery cloth should never be used to clean the commutator of a motor or generator:

- A. Because it contains particles which may lodge between commutator segments and cause short circuits

#345 A 3 HP ~~100~~ 110 V DC motor is 85% efficient when developing its rated output. What is the current?

- A. 23.93 A

[Typo in question. Since $3\text{HP} \times 746 \text{ W/HP} @ 85\% = 2.632\text{kW}$, and that $/ 110\text{V} = 23.93 \text{ A}$.]

#346 The speed of a synchronous motor is determined:

- A. By the number of pairs of poles
- B. By the line frequency

#347 The speed of an induction motor is determined:

- A. By the number of pairs of poles
- B. By the line frequency
- C. By the load

#348 The speed of a DC series motor is determined:

- A. By the load

#349 What is the line current of a 7 HP motor operating on 120 V at full load, a power factor of 0.8, and 95% efficiency?

- B. 57.2 A

[Not very exact, since $7 \text{ HP} * 746 \text{ W/HP} @ 95\% \& 0.8 \text{ PF} = 6.871 \text{ kW}$, which $/ 120 \text{ V} = 57.258 \text{ A}$]

#350 Alternators are usually rated in:

- A. Volt-amperes output

#351 What conditions must be met before two AC generators can be operated in parallel?

- A. Output voltages must be equal, frequencies must match
- B. Phase rotation, and relative phase positions must match

#352 The voltage of an alternator will:

- A. Decrease under load

#353 What effect will high coupling between the plate and grid circuits of a quartz-crystal oscillator have?

- C. Overheating of the crystal and possible breakage
- #354 The operation of a dynatron oscillator depends on what?
- B. The secondary emission from the anode
- #355 To provide additional feedback voltage in a crystal oscillator what is sometimes needed?
- A. An additional plate grid feedback capacitor
- #356 What is the primary reason for the use of a crystal controlled oscillator for use as a transmitter?
- C. Frequency stability
- #357 What are the advantages of self excited oscillator and master-oscillator power-amplifier transmitters?
- B. The self-excited oscillator transmitter is simpler to construct and has fewer parts than the master-oscillator
- #358 The primary function of the power-amplifier stage of a marine radiotelegraph transmitter is:
- D. To improve the frequency stability of the oscillator
[Not really its 'primary' function. Nevertheless...]
- #359 The buffer amplifier stage of a transmitter:
- C. To improve the frequency stability of the oscillator
- #360 Which class of amplifier is used in the final amplifier stage for maximum plate efficiency?
- C. Class C
- #361 What class of amplifier is used as linear in order not to distort the modulation components?
- B. Class B
[Other answers also correct. Nevertheless...]
- #362 If a class B linear final R-F amplifier were in saturation and no modulation what would happen when modulated?
- C. A condition of negative carrier shift would be the result
- #363 A class C amplifier:
- B. Output is present for less than 180 degrees of the input cycle
- C. Bias is set well beyond cutoff
- #364 What effect would insufficient radio-frequency excitation have on Class C modulated amplifier output?
- A. A negative carrier shift
- #365 The second harmonic of a 380 kHz frequency is:
- B. 760 kHz
- #366 Two effects of over-excitation of a Class B amplifier grid circuit are:
- B. Decreased plate efficiency, excessive grid current

- C. Excessive plate current, excessive distortion
- #367 Three main factors to consider about grid-leak in a vacuum tube transmitter:
- B. The value of grid leak resistance and duration of time the grid current is flowing
- C. Internal resistance of the tube between the grid and cathode
- #368 How can an R-F amplifier stage be neutralized?
- A. Vary the tuning of the plate tank circuit while observing the amp. meter
- #369 What is the purpose of a speech amplifier in connection with the modulator of a transmitter?
- B. To raise the signal-to-noise ratio and the output voltage of microphones
- #370 When the first speech-amplifier of a transmitter were overexcited, but the modulation capabilities were not exceeded what would be the effect on the output?
- C. The output would be distorted
- #371 The bias of a grid-modulated R-F stage is adjusted:
- D. 1 and half to 3 times plate current cutoff value
- #372 Given the following: (1) audio power for 100% modulation equals 50% of DC input power to RF modulated amplifier, (2) load presented to the modulated tube consists of the DC plate impedance of the modulated amplifier, (3) constant grid excitation voltage, very ~~let~~ low distortion, what type of modulation?
- B. Plate
- #373 Modulation occurring in an RF stage other than the final power amplifier:
- B. Low level
- #374 The efficiency of a grid-bias modulated stage should be:
- A. Maximum at complete modulation
- B. Minimum at zero modulation
- C. Either A or B
- #375 Does grid current flow in a grid-bias modulated stage under modulated conditions?
- A. Grid current may exist during the positive portions of the AF cycle
- B. Grid current may cause distortion
- #376 What might be the cause of a positive shift in carrier amplitude during modulation?
- A. Parasitic oscillations, excessive audio drive
- B. Incorrect tuning of final amplifier
- C. Insufficient RF excitation, incorrect neutralization
- #377 For 100% modulation, DC power input to the modulated RF amplifier should:
- B. Be 1/2 the AC power from the modulation
- #378 When a radiotelephone transmitter is 100% modulated by sinusoidal waveform, how much **change in** antenna current will be observed?
- A. 22.5 % increase
- #379 What can be done in a Heising modulation system to obtain 100% modulation?

A. Use a series resistor between the amplifier and modulator in the DC plate supply

#380 A plate choke in a Heising modulator:

A. Builds up audio modulating voltages

B. Feeds audio modulating voltages to the plate of the RF modulated amplifier to produce plate modulation

#381 What value of sinusoidal audio power is required to insure 100% modulation when the DC plate input to a modulated Class C amplifier has an efficiency of 60 % , and is 200 W?

A. 100 W

#382 What would be the antenna current when a transmitter has an antenna current of 8 amp, under A -1, **even if when** it is 100% modulated by sinusoidal modulation?

A. 9.8 amp

B. The antenna current will increase by 22.5%

C. Either A or B

#383 If a transmitter is adjusted for maximum power for telegraph, what must be done to be amplitude modulated?

A. The plate voltage must be reduced

C. Tubes would have to dissipate 1.5 times as much power if the plate voltage were not reduced

#384 A series-fed plate circuit of a vacuum tube amplifier has a short circuit of the plate bypass capacitor. What **happened would result?**

A. It would short out the power supply

B. It would remove the plate voltage

C. It would possibly damage the power supply

#385 A shunt-fed plate circuit of a vacuum tube amplifier has a short circuit of the plate RF choke. What happens?

A. The plate tank circuit would be effectively shorted

B. The DC plate current would increase, possibly to excess

C. No RF output could be expected

#386 The total bandwidth of a transmitter using A-2 emission with a modulating frequency of 800 Hz and a carrier frequency of 500 kHz is:

A. 1600 Hz

B. 1.6 kHz

[Answer A is official, despite B's identical value.]

#387 Given a vacuum tube of the following characteristics: plate voltage 1000 V, plate current 127 ma, filament current 5.4 amp, mutual conductance 8000 microvolts, and amplification factor of 25. What is the correct volume of negative grid bias for Class B amplifier?

A. 40 V

[$1V_g / 25V_p = V_g / 1000V_p$, thus $V_g * 25V_p = V_g * 1000V_p(V_g)$, thus $V_g = 1000V_p / 25V_p = 40V$]

#388 When the relative amplitudes of the positive and negative modulation peaks are unsymmetrical:

A. Carrier shift

- #389 What may be used as indicating devices in neutralizing an RF amplifier stage?
- A. Neon bulb, sensitive wavemeter
 - B. A flashlight bulb connected to a small loop of wire, a sensitive thermocoupler either attached to a small loop of wire
 - C. Amplifier grid current meter, a thermocouple meter connected in series with the plate tank
- #390 Important factors in the operation of the vacuum tube as a frequency doubler are:
- A. Plate tank should be tuned to twice the grid circuit frequency
 - B. The grid bias should be very large, the grid driving voltage must be very large, the plate voltage should be comparatively high
 - C. The plate tank circuit should have a low C to L ratio
- #391 If a 1500 kHz radio wave is modulated by a 2000 Hz sine wave tone, what frequencies does the modulated wave contain?
- A. 1500 kHz , 1502 kHz , 1498 kHz
- #392 To avoid damage to components what precautions should be observed in tuning a transmitter?
- A. It should be adjusted at reduced power
- #393 A transmitter has a master-oscillator, intermediate amplifier, and final amplifier. In what order should the circuit be adjusted in putting the transmitter in operation?
- A. Master-oscillator, intermediate amplifier, final amplifier, antenna circuit
- #394 Excessive plate current of an RF amplifier may be caused by:
- A. Plate-tank circuit off resonance, defective tube
 - B. Excessive loading of plate tank, insufficient bias, parasitic oscillations
 - C. Excessive plate and screen voltage, excessive excitation voltage, improper neutralization
- #395 The disadvantage of using a self-excited oscillator type of transmitter for shipboard service:
- A. Frequency instability
- #396 The degree of coupling is varied in a pi-network used to transfer energy from a vacuum tube plate circuit to an antenna:
- A. By adjusting the series capacitors
- #397 In order of selectivity, the best receivers are:
- A. Superheterodyne, tuned radio frequency, superregenerative
- #398 An RF filter in the plate circuit of a tube detector is sometimes necessary to:
- A. Prevent RF variations from affecting the following audio stages
- #399 In an RF amplifier with fixed bias, as the plate circuit is varied from below resonance to above resonance, what will the grid current do?
- A. The grid current will rise slightly at resonance
- #400 In a self-biased RF amplifier stage: plate voltage is 1250 V, plate current 150 ma, grid current 15 ma, grid-leak resistance of 4000 ohms, what is the operating grid bias?

A. 60 V

[$I_g * R_g = 15\text{mA} * 4\text{k}\Omega = 60\text{V}$]

#401 How would you determine the cathode bias resistance necessary to provide correct grid bias for an amplifier?

A. Bias is equal to IR drop across the cathode resistance

#402 What is a method of link coupling between two R-F amplifier stages?

A. The coupling together of two circuits which may be separated by a relatively large distance with low-impedance

#403 Which type of amplifier circuit is used in a link coupling R-F?

B. Push-pull

#404 An advantage of link coupling between RF amplifier stages is:

A. The flexibility of mechanical construction possible

B. Reduction of tube capacitance effects on the L/C ratio of the tank circuits

#405 What effect does excessive coupling between the output circuit of an oscillator and an antenna have?

C. The oscillator will be very unstable

#406 How is power output of a transmitter adjusted?

A. It should radiate the minimum power necessary to insure reliable communications

B. It may be controlled by varying the plate supply

#407 When is a transmitter tuned to reduced power?

A. The receiver is initially reduced because the receiver is very sensitive

[No clear correspondence between Q and A's. Nevertheless...]

#408 What is meant by split tuning?

A. An effect resulting from excessive coupling between two tuned circuits which are at the same frequency

B. Also known as double hump

#409 What is a self rectified circuit?

C. Provides a tone frequency for A-2 emissions

#410 What would be the dB change in field intensity at a given distance if the power is doubled?

A. 3 dB

#411 Keying can be accomplished at various points in a radiotelegraph transmitter. Some are:

A. At the primary of power transformer, at filament centertap, at screen grid circuit

B. At the control grid circuit, at the DC supply

C. A or B

#412 What is the term used when the receiving operator may interrupt the transmitting operator at any point during transmission?

C. Break-in operation

- #413 Which of the following best explains frequency-shift keying?
C. Changing the frequency of the output when the key is depressed
- #414 What is one of the advantages frequency-shift keying has over "on-off" keying?
C. Increase of signal-to-noise ratio
- #415 Code speed or number of words per minute transmitted have what effect if any on the bandwidth of emission of a radiotelegraph transmitter?
A. It does have an effect. Bandwidth increases as the code speed is increased
- #416 Keying a simple-oscillator type of emergency transmitter may be accomplished by:
A. Inserting the key in series with the primary of the high voltage plate transformer
- #417 The plate current of the final RF amplifier in a transmitter increases and radiation decreases, if the antenna circuit is in good order, what could be the cause?
A. Neutralization may have been upset
B. The plate circuit may have been detuned, bias may have been lost
C. Grid excitation may have decreased, there may be a faulty tube, or there may be parasitic oscillations
- #418 When hoisting a shipboard antenna, to avoid damage to the wire and insulators:
A. Avoid bending the wire
B. Avoid smashing the insulators against metal objects
- #419 If a field strength is 100 microvolts per meter at 100 miles, what is the field strength at 200 miles?
A. 50 microvolts
[FS @ 200 mi. = $100\mu\text{V/m} * 100\text{mi} / 200\text{mi} = 50\mu\text{V/m}$]
- #420 Field intensity is:
A. Directly proportional to the antenna current
[Wrong, actually. Nevertheless...]
- #421 What point on a shipboard antenna system displays the maximum potential?
A. The end of the antenna furthest from the transmission line connections
- #422 A defective vacuum tube in a transmitter may be indicated by:
A. Gas glow within the tube
B. No light from the filament
C. Reduced output
- #423 A master-oscillator power-amplifier transmitter has been operating normally. The antenna ammeter suddenly reads zero. All filaments are burning and plate and grid meters read normal currents and voltages. What happened?
A. A shorted antenna ammeter
B. An open connection in the remote reading meter
- #424 Effects of dirty or salt-encrusted insulation are:
A. Erratic readings of antenna current
B. Increased corona discharge
C. Decreased radiation power

#425 To reduce the sparking at the contacts of a key used in a radiotelegraph transmitter:
A. Connect a suitable key-click filter across the key

#426 In a self excited oscillator, a swinging antenna:
A. Will cause serious frequency instability

#427 What may be observed as the antenna circuit is brought into resonance about the plate current of the final amplifier?

A. It will increase

[Refers to antenna itself, not the plate.]

#428 Instruments used to indicate various DC currents and voltages in a transmitter may be protected against damage to stray RF by:

A. Insufficient grid blocking bias is applied to the grid when the key is open

B. Shorted bias resistor

C. Shorted key-click filter

[No correspondence between Q and A's. Nevertheless...]

#429 In a radiotelegraph transmitter with a DC generator plate voltage source, an AC generator filament supply, and grid-bias keying, what could be wrong when the emission continues with the key contacts open?

A. Insufficient grid blocking bias is applied to the grid when the key is open

B. Shorted bias resistor

C. Shorted key-click filter

#430 A station has an assigned frequency of 8000 kHz and a frequency tolerance of plus or minus 0.04%. The oscillator operates at 1/8th of the input. What is the maximum permitted deviation of the oscillation frequency in Hz, which will not exceed the tolerance?

A. Plus or minus 400 Hz

#431 A transmitter operating on 5000 kHz uses a 1000 kHz crystal with a tempered coefficient of - 4 Hz/MHz/°C. What is the change in the output frequency of the transmitter if the temperature increases 6 degrees centigrade?

A. ~~499.88 kHz~~ 4999.88 kHz

[Typo, since given $\Delta f/\text{MHz}/^\circ\text{C} = -4\text{Hz}$, then $(1\text{MHz} + (-4\text{Hz}/^\circ\text{C} * 6^\circ\text{C})) = 999.976\text{kHz} * 5 = 4999.88\text{kHz}$]

#432 The correct formula for determining the surge impedance of a quarter wavelength matching line is:

C. Impedance zero equal impedance of antenna times impedance of the line squared

#433 What are the three factors to consider when figuring the surge impedance of a non-resonant transmission line?

A. Diameter of the conductor, space between conductors, dielectric constant of insulating material

#434 If the output frequency after passing through three doubler stages is 16,800 kHz, give the crystal frequency of a transmitter:

C. ~~2110 kHz~~ 2100 kHz

[Typo, since $16,800\text{ kHz} / 2 / 2 / 2 = 2100\text{ kHz}$]

#435 Adding an inductor in series with an antenna will have what effect on the resonant frequency?

A. Decrease

#436 Adding a capacitor in series with an antenna will have what effect on resonant frequency?

B. Increase

#437 The radiated wavelength of a Hertzian antenna is:

D. Approximately twice the physical length of the antenna

#438 To operate on a lower resonant frequency on an available Marconi antenna which would be the correct procedure?

B. Add an inductor in series with the antenna

#439 By reducing the physical length of a Hertzian antenna what are the results?

D. The resonant frequency will increase

#440 Which antenna system has the ability to discriminate between various directions of receiving or transmitting?

D. Single element vertical antenna

[Clearly wrong. Nevertheless...]

#441 Given the current and resistance of the base of a Marconi antenna, what would be the formula for determining the power?

B. $P = \text{amps. squared} \times \text{resistance}$

#442 A vertical loop antenna has a:

A. Omni-directional pattern which is maximum in the directions of the plane of the loop, and minimum in the directions broadside to the loop

D. Has a bi-directional pattern which is maximum in the direction of the plane of the loop, and minimum in the directions broadside to the loop

#443 What modulation is contained in static and lightning radio waves?

C. Amplitude modulation

#444 The difference between a Hertz and Marconi antenna is:

A. The physical length

#445 What is meant by the term polarization of a radio wave?

C. The polarization of a radio wave is determined by the direction of the electromagnetic wave plane

#446 What are the lowest frequencies used in radio communication today?

C. 15 kHz

#447 Radio frequencies that are useful for long distance communications requiring continuous operation:

A. Low frequency

- #448 Communication at frequencies in the order of 15 kHz are usually accomplished by ground waves, and require generation of _____ power outputs for reliable and continuous operation:
- C. Extremely high power
- #449 Frequencies with substantially line propagations:
- A. VHF, UHF, microwave
 - B. About 50-30,000 MHz
- #450 On an average yearly basis the received Trans-Atlantic signals increased in strength in proportion to the degree of _____. Made on the basis of the 11 year cycle:
- A. Sun spot activity
- #451 Harmonic radiation is:
- A. Radiation occurring on frequencies that are whole multiples of the original frequency
 - B. Is always higher than the fundamental frequency
 - C. Reduced by proper tuning of the transmitter
- #452 Harmonic radiation from a transmitter may cause interference:
- B. In other shipboard equipment
- #453 Why suppress RF harmonics in the output of a transmitter?
- A. To prevent interference from occurring with other radio services
 - B. To restrict the bandwidth of the particular station to the legal limits
- #454 A wavetrapp in a receiver:
- A. Prevents the effects of any undesired output of the receiver
- #455 The follow devices that could be used to indicate oscillation in a crystal oscillator are:
- A. Plate DC milliammeter, grid DC ammeter, neon bulb
 - B. Thermogalvanometer, wavemeter
 - C. Flashlight bulb on a loop of wire, heterodyne type frequency meter
- #456 An artificial antenna sometimes used in testing a transmitter:
- A. Dummy antenna
 - B. Dummy load
 - C. Prevents undesired radiation
- #457 The system producing A-2 emission by a "chopper" may be thought of:
- A. As a double-keying system
 - B. The automatic "chopper" turns the transmitter on and off at a rapid rate
 - C. The other key is a normal hand operated key
- #458 Advantages of high-frequency radio communication:
- A. The upper frequencies are substantially free of atmospheric interference, small antennas permit efficient mobile operation
- #459 Transmitters that employ variometers rather than variable capacitors as tuning elements do so because of:
- A. The size of required variable capacitors in the medium frequency band
 - C. Variometers can be relatively compact

#460 The relationship between the antenna current and radiated power of an antenna:

- A. $P = I^2 * R$
- B. $P = I^2 * \text{radiated radiation resistance}$

#461 Iron compound cylinders found in inductances:

- A. Increase Q
- B. Increase selectivity
- C. Increase gain

#462 Modulation of an RF carrier produces in the plate circuit of the last radio stage of the system:

- A. High-level modulation

#463 Basically, an FM receiver is a conventional superheterodyne but differs in:

- A. The method of detection
- B. The reduction of sensitivity to amplitude modulation
- C. De-emphasis

#464 A form of regenerative receiver in which the detector breaks into and out of oscillation at a rate above audibility:

- A. Superregenerative receiver

#465 A tuned RF amplifier stage ahead of the mixer stage in a superheterodyne receiver:

- A. Improves receiver sensitivity, improves image rejection
- B. Improves selectivity, improves stability
- C. Improves signal-to-noise ratio, reduced interference

#466 What is the "mixer" tube in the superheterodyne receiver?

- A. The first detector
- [Out-of-date terminology]

#467 An incoming signal causing image interference is _____ the IF above or below the frequency to which the receiver is tuned:

- A. Twice

#468 A superheterodyne receiver is adjusted to 2738 kHz. The IF is 475 kHz. What is the grid circuit of the second detector tuned to?

- A. 475 kHz

#469 A superheterodyne receiver may not successfully be used for reception of frequencies very near the IF frequency:

- A. Because those near frequencies would pass directly through the IF amplifier and not be greatly affected by the tuning of the RF or oscillator stages

#470 Some superheterodyne receivers employ a crystal-controlled oscillator:

- A. To insure maximum stability of operation

#471 To obtain maximum response to weak CW signals with a superheterodyne receiver:

- A. RF gain control should be fully advanced
- B. BFO control varied to obtain the clearest tone

- C. AVC advanced to the best volume
- #472 Most receiver hiss is due to:
A. Noise generated in the first detector
- #473 High IF frequencies in a superheterodyne receiver:
A. Reduce image frequency response
- #474 What is the IF of a superheterodyne receiver receiving on 1000 kHz and the mixing oscillator is tuned to 1500 kHz?
A. 500 kHz
- #475 Image response may be minimized in a superheterodyne receiver:
A. By using one or more tuned RF stages ahead of the mixer
C. By choosing a suitable IF (such that the image frequency will fall outside of the receiver's operating range)
- #476 In a tuned RF receiver the heterodyne method, over the autodyne reception, has:
A. Great sensitivity
B. More stable operation of the circuit
C. Wider control of the beat-frequency
- #477 A regenerative receiver's operation is:
A. An incoming RF carrier is coupled into the tuned-grid circuit and applied to the grid
B. It is then amplified in the usual manner. A controllable portion of the plate signal is coupled back into the grid circuit
C. The coupled back signal is in phase with the original signal thus amplifying it and providing a greater output signal in the plate circuit
- #478 Advantages of a stage of RF amplification are:
A. Improved sensitivity, improved signal-to-noise ratio
B. Improved selectivity, improved signal-to-noise ratio
C. Improved signal-to-noise ratio, more efficient and more stable operation of the detector
- #479 Disadvantages of a stage of RF amplification are:
A. A power audio amplifier would be needed to operate a loudspeaker
B. An RF amplifier requires additional tuned circuits and tuning elements
C. Shielding will probably be necessary
- #480 The sensitivity of a 3 circuit receiver is controlled by:
A. The setting of the regeneration control
- #481 A regenerative, oscillating-detector receives directly coupled to an antenna:
A. May radiate energy that can beat with other carrier frequencies and cause heterodyning interference in a number of receivers
- #482 Low sensitivity of a 3 circuit regenerative receiver might be caused by:
A. Faulty tube
B. Out of phase feedback
C. Insufficient feedback

#483 Some components of a three-circuit regenerative circuit tested in troubleshooting:

- A. All tubes, power supply voltage, continuity of coils
- B. Proper contacting of each position of tapped switches, pigtail connections, shorted variable capacitor
- C. Grid leak for open circuit, grid capacitor for short, audio transformer for continuity, jacks & cords, antenna and ground connections

#484 Noisy operation of a regenerative, 3-circuit receiver with two stages of AF amplification may be caused by:

- A. Defective tubes, poor connections
- B. Defective audio transformers
- C. Defective grid resistance of grid-capacitor, or defective elements in the power supply

#485 How could you test a regenerative receiver to determine if the detector is oscillating?

- A. Touch a finger on grounded wire to the grid circuit. You will hear a "plop" if the circuit was oscillating
- B. Vary the regeneration control to its maximum limits. You will hear a "plop" as the circuit goes in and out of oscillation
- C. Either A or B

#486 How would you adjust a regenerative receiver without RF amplifier stages to receive radiotelegraph signals through interference?

- A. Provide the maximum selectivity and gain at the incoming signal frequency

#487 How would you reduce or eliminate broadcast signal interference of reception on 500 kHz?

- B. Use a suitable wavetrapp resonated to reject the undesired signals

#488 To adjust a regenerative receiver for maximum sensitivity:

- A. The station is tuned in with the receiver in the oscillating condition
- B. Slowly back the regeneration control off until the receiver just breaks out of oscillation and is also below the fringe howl point
- C. First A then B

#489 What type of radio receiver do not respond to static interference?

- B. FM receivers have better sensitivity to such interference
- C. Both AM & FM

[Neither answer makes sense. Even so...]

#490 Audio howl may be caused by:

- A. A "fringe" setting of the regeneration control
- B. A defective tube
- C. An open grid resistor

#491 If signals are heard with headphones in the detector plate circuit of a receiver, but none are heard with headphones in the first AF stage plate circuit, what might be the cause?

- A. Open winding of the coupling transformer
- B. Defective coupling capacitor, improper operating potentials
- C. Defective tube

#492 In the case of an open secondary winding in a coupling transformer causing no signal in the first AF stage, satisfactory repair could be made by:

- A. Replacing the transformer
- B. Disconnecting the secondary winding and changing the coupling system to impedance coupling with a grid resistor and coupling capacitor

#493 An oscillator in a receiver operating on a frequency near the IF of the receiver:

- A. Beats with the IF in the second detector to produce an audible note

#494 Generally used to prevent any undesired frequencies from appearing in the output of a receiver:

- A. Wave trap

#495 By-pass capacitors across the cathode-bias resistors of an RF amplifier:

- A. Prevent variations of bias during excitation of the amplifier
- B. Results in better gain of the amplifier stage

#496 In general, shielding between RF amplifier stages:

- A. Prevents electromagnetic coupling
- B. Prevents electrostatic coupling
- C. Improves the overall stability of a receiver

#497 Minimizes transfer of harmonic frequencies between two inductively coupled circuits:

- D. None of the above

#498 An auxiliary receiving antenna on a ship with a radio direction finder:

- B. Enables the radio operator to maintain watch on 500 kHz whether or not the direction finder is in use

#499 Feeding back into the control grids of the IF and RF amplifiers a negative DC bias which is proportioned to the average magnitude of the received carrier wave accomplished:

- B. Automatic volume control

#500 The center-tap connection in a filament supply transformer:

- A. Prevents hum voltages from modulating the normal signal
- B. The voltage change on one side of the filament will be effectively cancelled out by an equal and opposite voltage change at the other side of the filament, yielding no hum

#501 A shorted grid capacitor in a three-circuit regenerative receiver would:

- A. Render the receiver mostly or completely inoperative
- C. Some forms of plate detection might occur but with considerably reduced sensitivity and volume

#502 The first detector in a superheterodyne receiver:

- A. Acts as a mixer, providing the action which produces the desired intermediate frequency
- B. The first detector must be operated on the non linear portion of its characteristic to provide the proper action

#503 The advantage of using iron cores of special construction in RF transformers and inductance?

- A. Increase of Q and gain of circuits using such cores

- B. Increase of selectivity and gain of circuits using such cores
- C. Increase of Q and selectivity

#504 The auto alarm receiver is tuned to _____ but is able to respond to signals from _____ to _____ (+/- 12.5 kHz)

- A. 500 kHz, 487.5 kHz, 512.5 kHz

#505 The auto-alarm signal is:

- A. Four consecutive dashes from C. 5 to D. 5 seconds, separated by spaces ranging from 0.1 to 0.5 seconds. The combination may not exceed 5 seconds

[Really shown like that.]

#506 The determining factor of the setting of the sensitivity control of an auto-alarm receiver:

- A. Prevailing static at a given time
- B. Radio interference at a given time

#507 With an auto alarm that uses a square-law detector and a mechanical selector what causes the bell to ring?

- A. Receipt of the true auto-alarm signal, low battery voltage
- B. Filament circuit open, the 24 V circuit to receiver open
- C. Battery charger fuse blown, motor stopped or running

#508 Intermittent ringing of the bells of an auto alarm with a linear detector and an electronic selector could be caused by:

- A. An intermittent vacuum tube filament
- B. Fluctuating line voltage
- C. Faulty contacts or relay adjustment of warning relay receiver

#509 An open filament on an auto-alarm with a linear detector and an electronic selector will:

- A. De-energize the restore relay K-105
- B. K105 applies voltage to K-100, time delay relay
- C. K106 causes the bell to ring after about 2 minutes

#510 The auto-alarm bell rings and the release button stops it:

- A. There could be reception of a true alarm signal
- B. There could be reception of a false alarm signal
- C. A or B

#511 If the auto-alarm bell rings and the release button doesn't stop it:

- A. Bell relay K-107 could be stuck, or there could be an open filament
- B. The alarm bell relay circuit ground could be bad
- C. There could be failure or low line voltage

#512 If the vacuum tube heater in an approved auto-alarm system burns out:

- A. A pair of contacts close and energize the bell relay

#513 Unused portions of inductances in receivers are _____ to reduce any losses that might occur in these unused windings:

- A. Shorted

#514 Harmonic radiation by a transmitter may be prevented:

- B. By using a Faraday shield between the final amplifier and antenna circuit
 - C. By using suitable tuned filters in the transmission line system
- #515 The keying circuit of the ship's transmitter is disconnected:
- A. When the auto-alarm antenna switch is placed in the auto-alarm operating position
- #516 Normal undistorted modulation is indicated by:
- A. An increase in antenna current without carrier shift
- #517 If a vacuum tube in the only RF stages of your receiver burned out, make a temporary repair by:
- A. Remove its tube and connect a small (about 0.001 microfarad) capacitor between the control grid and plate connections
 - B. Connect the antenna to the control grid of the stage following the one which was burned out
 - C. Either A or B
- #518 A _____ provides a very high degree of selectivity in a receiver:
- A. Crystal filter
- #519 The D'Arsonval type meter consists of:
- A. A permanent magnet, a movable coil with pointer attached rotating in jewel bearing
 - B. A movable coil with pointer attached rotating in jewel bearings, and two spiral springs (one on each side of the removable coil)
- #520 What is the purpose of multiplier resistance used with a voltmeter?
- B. To increase the voltage indicating range of the voltmeter
- #521 What is the purpose of a shunt as used with an ammeter?
- B. To permit an increase in the indicating range of the meter which is almost inversely proportional to the resistance of the shunt
- #522 What is indicated if a voltmeter connected between the negative side of a ship's DC line and ground reads the full line voltage?
- B. This indicates that the positive side of the line, rather than the negative side is grounded
 - C. The generator terminals should be reversed
- #523 Why are copper oxide rectifiers, associated with DC voltmeters to measure AC, unsuitable for the measurement of voltages at radio frequencies?
- C. Because of the relatively large shunt capacitance of the copper oxide rectifier
- #524 How may the power in a AC circuit be determined?
- A. The power in an AC circuit may be determined by a wattmeter
 - B. By multiplying the product of the circuit voltage and current by the power factor
- #525 The product of the readings of an AC voltmeter and ammeter in an AC circuit is called what?
- B. Apparent power
- #526 Does an AC ammeter indicate peak, average, or effective values of current?
- B. The conventional AC ammeter is calibrated to indicate effective (RMS) values of current

#527 What types of meters may be used to measure RF currents?

- A. The hot wire ammeter
- B. The thermocouple ammeter

#528 How may the range of a thermocouple ammeter be increased?

- A. By using a current transformer
- B. By using a capacitor shunt

#529 By what factor must the voltage of an ac circuit, as indicated on the scale of an AC voltmeter, be multiplied to obtain the average voltage value?

- A. By the factor of 0.9

#530 By what factor must the voltage of an AC circuit, as indicated on the scale of an AC voltmeter, be multiplied to obtain the peak value?

- B. The multiplying factor is A. 414

[Really shown like that]

#531 What is the meaning of "zero beat" as used in connection with frequency measuring equipment?

- A. Zero beat occurs when two frequencies are being mixed together and have no difference frequency between them

#532 What is the directional reception pattern of a loop antenna?

- A. A vertical loop antenna has a bidirectional pattern which is maximum in the directions in the plane of the loop, and minimum in the directions broadside to the loop
- B. A horizontal loop antenna is nondirectional along the plane of the loop. It has minimum radiation or reception vertically

#533 What is the reception pattern of a vertical antenna?

- A. It has minimum radiation or reception vertically

#534 What is the principal function of a vertical sense antenna associated with a unilateral radio direction finder?

- A. To determine from which direction the signal is coming

#535 What figure represents the reception pattern of a properly adjusted unilateral radio direction finder?

- A. A cardioid
- C. A heart shaped figure

#536 From how many simultaneous directions is a direction finder capable of receiving signals if adjusted to take unilateral bearings through 360 degrees?

- C. From all but one direction

#537 How is the unilateral effect obtained in a direction finder?

- D. None of the above

#538 What is the function of the balancing capacitor in a direction finder?

- C. To minimize "antenna effect" and so obtain a sharper null point indication of direction

#539 What is indicated by the bearing obtained from the use of a bilateral radio direction finder?

B. A line of direction which passes through the originating station

#540 On shipboard what factors may effect the accuracy of a direction finder after it has been properly installed, calibrated?

A. A received wave which has been bent by night effect

B. By any changing of the position of nearby metallic objects

#541 What is indicated by the bearing obtained from the use of a unilateral radio direction finder?

B. The sense of direction of the originating station

#542 Within what frequency band limits do all United States marine radio beacon stations operate?

C. From 285 to ~~315~~ 325 kHz

#543 In what part of the RF spectrum do marine radar systems operate?

A. In the order of 10,000 MHz or 3000 MHz

B. Wavelength of 3 cm or 10 cm

#544 Approximately at what speed does the antenna of a navigational radar rotate?

B. At speeds ranging from about 6 to 15 RPM

#545 How should a radar set be adjusted by the operator to reduce "sea return"?

C. The operator should manually adjust the "suppressor" control or sensitivity time control, STC

#546 In determining a "fix" position by a marine LORAN system, what is the minimum number of land transmitters involved?

D. Four, or two pairs of "master and "slave" stations

#547 What is the relationship between a master and a slave station in reference to LORAN navigation systems?

A. A master station originates the RF pulse which then travels in all directions and is intercepted by the slave station

#548 How can the operator of a LORAN receiver on shipboard identify the transmitting stations that are being received?

A. By their pulse recurrence rate

B. By reference to their frequency of transmission

#549 During daytime hours, approximately what is the maximum distance in nautical miles from LORAN transmitting stations from which LORAN lines of position can be determined?

A. About 700 miles

#550 What is the purpose of blinking in a loran navigational system?

A. To warn the receiving operator that difficulty exists at the transmitting stations?

#551 What precautions should an operator or serviceman observe when working with cathode-ray tubes?

- A. The tube must not strike against any hard surface
- B. The tube might implode
- C. Safety goggles and gloves should be worn when handling cathode-ray tubes

#552 If the velocity of a radio wave is 186,000 statute miles per second, how many nautical miles does a radar pulse travel in one microsecond?

- A. 0.1614 nautical miles

#553 In all cases other than those in which the transmitter output must be maintained at a fixed value, what amount of power should be employed for routine communications?

- C. The minimum amount of power necessary to ensure reliable communications

#554 What is the definition of a "station open to public service"?

- A. A station which handles public correspondence
- B. Paid or toll messages
- C. Radiotelephone facilities for the general public at prescribed rates

#555 In the transmission of the international Morse code, what are the relative time lengths of dashes, dots?

- C. Dashes are about three times as long as dots

#556 Why is the clock on a compulsorily equipped ship radiotelegraph station required to have a sweep second hand?

- A. To be able to accurately time the spaces and dashes of the auto-alarm system
- B. To accurately time the silent periods

#557 Between what points on a ship, compulsorily equipped with a radiotelegraph installation, is a reliable intercommunication system required?

- C. Between the radio room and the navigation bridge

#558 Are there any age requirements that a person must meet before he can be issued a radiotelegraph operator license?

- B. At least 21 years of age for a first class license

#559 Upon compulsorily equipped vessels which are required to have an accurate clock in the radio room, how frequently must this clock be adjusted and be compared with standard time?

- D. At least once every 24 hours

#560 How frequently must an entry be made in a ship radiotelegraph log while a radio watch is being maintained?

- A. At least every 15 minutes
- B. This is in addition to the entries referring to silent periods

[All answers untrue. Question supposedly reference military procedure.]

#561 At what time(s) are routine transmissions forbidden in the bands of 480 to 515 kHz?

- C. Routine transmissions are forbidden during the international silent period

#562 What time system shall be used in making log entries with respect to the observance of the international silent period?

- B. Greenwich Mean Time according to the 24 hour system

#563 What is the international radiotelegraph distress frequency for stations in the mobile service?

C. 500 kHz

#564 Describe how a distress call should be made:

C. The distress call shall include the distress signal transmitted three times, the word DE, and the call signal of the mobile station in distress transmitted three times

#565 What transmission should precede the transmission of the distress call?

A. The distress call, when sent in radiotelegraph on 500 kHz shall as a general rule, be immediately preceded by the auto-alarm signal

#566 What stations shall be in control of distress traffic?

B. The control of the distress traffic rests with the mobile station in distress

C. With the mobile station which sends the distress call in the event that the station in distress is not able to transmit it

#567 During what periods must a distress message be repeated following the initial transmission?

A. Until an answer is received, especially during the silent periods

#568 For how long must mobile stations listen after hearing an urgency signal?

A. For at least 5 minutes

#569 When the auto-alarm bell rings, what should the operator do?

A. Proceed immediately to the radio room and press the reset button

B. If the bell stops, the operator should listen for further signals

#570 What space of time should elapse between the transmission of the international auto-alarm signal and the distress call?

A. 2 minutes

#571 While a vessel is at sea, how frequently must the auto-alarm be tested?

C. At least once every 24 hours

#572 Upon hearing an SOS, what should an operator do?

B. Immediately cease all transmissions capable of interfering with the distress traffic

#573 What is the purpose of an auto-alarm signal keying device on a compulsorily equipped ship?

C. To automatically produce the correct auto-alarm signal

#574 On a United States vessel equipped with an approved auto-alarm, where is the control button which silences the warning bells located?

C. In the main radiotelegraph operating room

#575 With what type(s) of emission and upon what frequency should a transmitter be adjusted to transmit a distress call?

C. The international distress wave of 500 kHz / type A-2 OR B emission

#576 If you receive a distress call signed by a call signal composed of five letters, could you determine the type of craft which transmitted the signal?

- A. Five letter call signals are assigned to aircraft stations
- B. Three letter call signals are assigned to land stations
- C. Four letter call signals are assigned to ship stations

#577 While the vessel is in the open sea, how frequently must the specific gravity of the emergency battery be taken?

- B. Once daily

#578 How frequently must the quantity of fuel in the supply tank for use with an oil or gas driven emergency generator be checked while the vessel is in the open sea?

- D. Once daily

#579 While a vessel is in port, how frequently should the emergency equipment be tested?

- D. Only when the vessel is ready to leave port

#580 You intercept "CQ CQ WSV TFC"; what does this mean?

- A. General call to all stations
- B. Call letter of a coastal station
- C. Traffic

#581 Explain the use and meaning of the following indicator or prefix "RP" on radiotelegrams:

- C. "Reply paid"

#582 Upon what band, in addition to the 350 to 515 kHz band must a main receiver on a United States ship be capable of operation?

- C. 100 TO 200 kHz

#583 After a distress call has been transmitted, every distress-traffic radiotelegram shall contain what symbol in the preamble?

- B. The distress signal preceding the call and repeated at the beginning of the preamble

#584 For how long a period of continuous operation should the emergency power supply of a compulsorily equipped ship station be capable of energizing the emergency radiotelegraph installation?

- A. At least 6 consecutive hours

#585 What is the principal port of the United States, on the Pacific coast, at which navigation lines terminate?

- B. San Francisco

#586 In what city is the major telecommunication center of the United States located?

- B. New York City

#587 Under what condition may an eligible person hold a radiotelegraph operator's license and a Marine Radio Operator permit?

- C. No person may hold any class of radiotelegraph operator's certificate and a Marine Radio Operator Permit

#588 How does a First Class Radiotelegraph Operator renew an unexpired license?

C. By submitting Form 756, current license copy, and appropriate fee to the FCC during the last year of the five year license term

#589 How does an eligible Second Class Radiotelegraph Operator upgrade his license to First Class?

A. By submitting the necessary Proof-of-Passing Certificates (PPC) from a COLEM along with the required fee and Form 756 to the FCC

#590 What is the license term of the First Class Radiotelegraph Operator License?

D. The license term is five years and may be renewed indefinitely without retesting
[Obsolte. Now lifetime.]

#591 What is a requirement of every commercial operator on duty and in charge of a transmitting system?

B. The original license or a photocopy must be posted or in the operator's personal possession and available for inspection

#592 What is the experience requirement of a First Class Radiotelegrapher?

C. The applicant must have a background of sending or receiving radiotelegraph messages for one year
[Obsolte rule.]

#593 What examination requirements are necessary to obtain a Second Class Radiotelegraph Operator's Certificate?

C. Successful completion of written test Elements 1, 5 and 6 on basic radio law and operating practices plus telegraphy Elements 1 and 2
[Obsolte rule.]

#594 How does an applicant qualify for a Third Class Radiotelegraph Operator's Certificate?

A. By passing the appropriate written examinations and receiving by ear code groups and plain text for a period of one minute without error at the appropriate speed
[Obsolte rule.]

#595 What examination credit is accorded Amateur Extra Class operators?

C. Commercial radio operator telegraphy Elements 1 and 2

#596 What must every examination for the code portion of a radiotelegraph license contain?

D. All alphabet letters, all numerals, period, comma, question mark, slant mark and prosigns AR, BT, and SK

#597 What answer format is accepted on commercial radiotelegraph license contain?

C. Examinees are required to receive international Morse code messages by ear for a period of one minute without error

#598 What is a requirement of all transmitting apparatus used aboard United States vessels?

C. Only equipment that has been type accepted by the FCC for Part 80 operations is authorized

#599 What happens to a lower grade of Commercial Radiotelegraph License when a licensee qualifies for a higher grade?

C. The lower grade is canceled. Only one unexpired radiotelegraph operator's certificate may be held at the same time

#600 What is an operating control requirement of a ship station using telegraphy?

A. The ship station must be capable of automatically changing from telegraphy transmission to telegraph reception

#601 How does a radiotelegraph operator transmit a routine call to another station?

B. The station is called not more than twice, followed by the word "DE" and the call sign of the calling station not more than twice

#602 What is the proper procedure to conduct a radiotelegraph equipment test?

B. Sending a series of "VVV" followed by the call sign of the testing station at about 10 words-per-minute

#603 How often must a radiotelegraph station transmit its call sign when a transmission is maintained for more than 20 minutes in the band 405-525 kHz?

A. At 20 minute intervals.

#604 When may a public coast station authorized to use high frequency narrow-band direct-printing (NB-DP) establish contact with a ship station using telegraphy?

C. When the radio station license reflects authority for this type of operation and harmful interference is avoided

#605 Which operator is authorized to make equipment adjustments at maritime radio stations which may affect transmitter operation?

C. Only the holders of a first or second class radiotelegraph of the general radiotelephone operator's license

#606 Who may install, maintain or adjust radiotelephone transmitters which radiate less than 50 watts carrier power?

A. Anyone under the immediate supervision and responsibility of a person holding a first or second class radiotelegraph or general radiotelephone operator license

#607 Who may program authorized frequency channels into a transmitter or transceiver used in the maritime service?

D. Only persons holding a first or second class radiotelegraph operator's certificate or a general radiotelephone operator's license

#608 What is the maximum authorized bandwidth of a high frequency radiotelegraphy signal, emission A1A, in the maritime service?

A. 0.4 kHz

#609 What is the maximum transmitter power that a ship station may radiate using radiotelegraphy emissions on frequencies below 27500 kHz?

C. 3 kW

#610 Where must ship station logs be kept during a voyage?

C. At the principal radiotelephone operating position or radiotelegraph operating room

#611 How often must compulsory radiotelegraph installations on passenger vessels be inspected?

D. Equipment inspections are required at least once every 12 months

#612 What is the antenna requirement aboard a survival craft equipped with a non-portable radiotelegraph installation?

B. The antenna must be single wire inverted L type of maximum practicable length and height above the waterline

#613

What document is issued after a radio station inspection aboard a large ship that is not a passenger vessel?

C. Cargo ship safety radiotelegraphy or radiotelephony certificate

#614 What is the minimum radio operator license requirement of a chief radio officer on U.S. passenger ships?

B. First Class Radiotelegraph Operator Certificate

[No longer true, as Safety of Life at Sea (SOLAS) requirements now are subject to GMDSS requirements.]

#615 What is the order of priority of radiotelegraph communications in the maritime services?

C. Distress calls, and signals, followed by communications preceded by urgency and safety signals

#616 What should a station operator do before making a transmission?

B. Except for the transmission of distress calls, determine that the frequency is not in use by monitoring the frequency before transmitting