Extra Class License Things to Know #7

1. A bistable circuit is a flip-flop.

2. Two output level changes are obtained for every two trigger pulses applied to the input of a "T" flip-flop circuit.

3. A flip-flop can divide the frequency of pulse train by 2.

4. 2 flip-flops are required to divide a signal frequency by 4.

5. An astable multivibrator is a circuit that continuously alternates between two unstable states without an external clock.

6. A characteristic of a monostable multivibrator is that it switches momentarily to the opposite binary state and then returns, after a set time, to its original state.

7. An AND gate produces a logic "1" at its output only if all of its inputs are logic "1s".

8. A NAND gate produces a logic "0" at its output only when all of its inputs are logic "1s".

9. An OR gate produces a logic "1" at its output if any or all of its inputs are logic "1s".

10. A NOR gate produces a logic "0" at its output if any or all of its inputs are logic "1s".

11. A truth table is a list of inputs and corresponding outputs for a digital device.

12. The name for logic which represents a logic "1" as a high voltage is Positive Logic.

13. The name for logic which represents a logic "0" as a high voltage is Negative logic.

14. A signal cycle operates at more than 180 degrees but less than 360 degrees in a Class AB amplifier.

15. A Class C amplifier provides the highest efficiency.

16. On the load line of a Class A common emitter amplifier, bias would normally be set at approximately half-way between saturation and cutoff.

17. Installing parasitic suppressors and/or a neutralize the stage can be done to prevent unwanted oscillations in a power amplifier.

18. Push-pull amplifiers reduce or eliminate even-order harmonics.

19. When a Class C rather than a class AB amplifier is used to amplify a single-sideband phone single, it is likely the signal may become distorted and occupy excessive bandwidth.

20. A vacuum-tube power amplifier can be neutralized by feeding back an out-of-phase component of the output to the input.

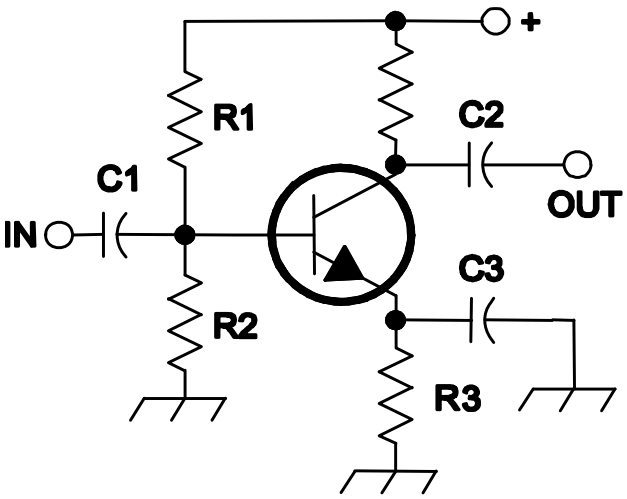
21. The tuning capacitor is adjusted for minimum plate current, while the loading capacitor is adjusted for maximum permissible plate current describes how the loading capacitor and tuning capacitor are to be adjusted when tuning a vacuum tube RF power amplifier that employs a pi-network output circuit.

22. In Figure E7-1, the purpose of R1 and R2 are fixed bias.

21. In Figure E7-1, the purpose of R3 is self bias.

22. A Common emitter amplifier is the type of circuit that is shown in Figure E7-1.

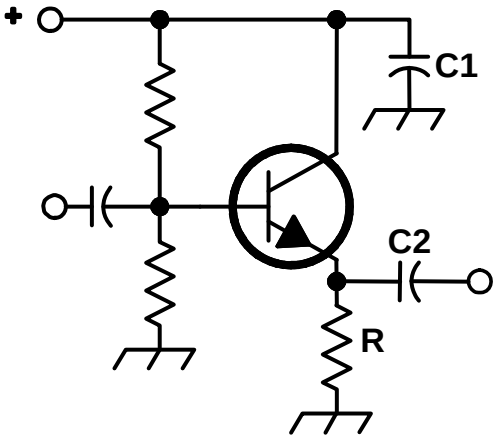
Figure E7-1



23. In Figure E7-2, the purpose of R is that of an emitter load.

24. In Figure E7-2, the purpose of C2 is that of output coupling.

Figure E7-2



25. Ways to prevent thermal runaway in a transistor amplifier is through neutralization, the selection of transistors with high beta and the use of degenerative emitter feedback,

26. The effect of intermodulation products in a linear power amplifier is the transmission of spurious signals.

27. Third-order intermodulation distortion products are of particular concern in linear power amplifiers because they are relatively close in frequency to the desired signal.

28. A characteristic of a grounded-grid amplifier is its low input impedance.

29. A klystron is a VHF, UHF, or microwave vacuum tube that uses velocity modulation.

30. A parametric amplifier is a low-noise VHF or UHF amplifier relying on varying reactance for amplification.

31. A FET is generally best suited for UHF or microwave power amplifier applications.

32. The capacitors and inductors of a low-pass filter Pi-network arranged between the network's input and output are when a capacitor is in parallel with the input, another capacitor is in parallel with the output, and an inductor is in series between the two.

33. A T-network with series capacitors and a parallel (shunt) inductor has the following properties: It transforms impedance and is a high-pass filter.

34. The advantage that a Pi-L-network has over a Pi-network for impedance matching between the final amplifier of a vacuum-tube type transmitter and an antenna is its greater harmonic suppression.

35. A network transforms a complex impedance to a resistive impedance by canceling the reactive part of an impedance and transforms the resistive part to the desired value.

36. A Chebyshev filter is described as having ripple in the passband and a sharp cutoff.

37. The distinguishing feature of an elliptical filter is its extremely sharp cutoff, with one or more infinitely deep notches in the stop band.

38. A notch filter is the kind of audio filter that you would use to attenuate an interfering carrier signal while receiving an SSB transmission.

39. An adaptive filter is the kind of digital signal processing audio filter that might be used to remove unwanted noise from a received SSB signal.

40. A Hilbert-transform filter is the type of digital signal processing filter that might be used in generating an SSB signal.

41. A cavity filter is the type filter that would be the best choice for use in a 2-meter repeater duplexer.

42. Pi is the common name for a filter network which is equivalent to two L networks back-to-back.

43. A Pi-L network, as used when matching a vacuum-tube final amplifier to a 50-ohm unbalanced output, is a network consisting of two series inductors and two shunt capacitors.

44. One advantage of a Pi matching network over an L matching network is that a Q of Pi networks can be varied depending on the component values chosen.

45. Digital is the mode that is most affected by non-linear phase response in a receiver IF filter.

46. One characteristic of a linear electronic voltage regulator is that the conduction of a control element is varied to maintain a constant output voltage.

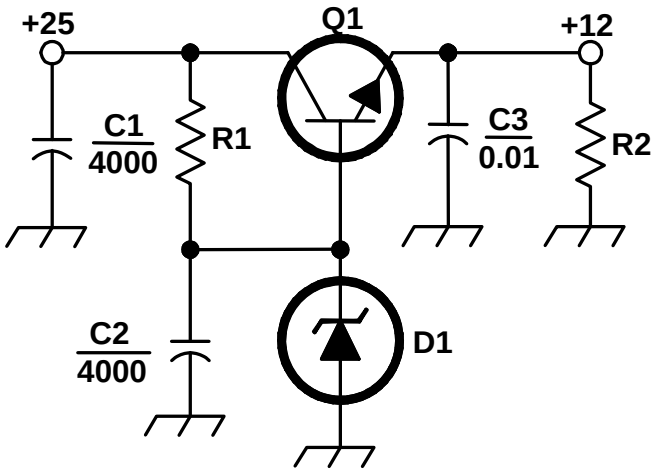
47. One characteristic of a switching electronic voltage regulator is that the control device's duty cycle is controlled to produce a constant average output voltage.

48. A Zener diode is the device that is typically used as a stable reference voltage in a linear voltage regulator.

49. A series regulator is the type of linear regulator that makes the most efficient use of the primary power source.

50. A shunt regulator is the type of linear voltage regulator that places a constant load on the unregulated voltage source.

Figure E7- 3



51. The purpose of Q1 in the circuit shown in Figure E7-3 is to increase the current-handling capability of the regulator.

52. The purpose of C2 in the circuit shown in Figure E7-3 is to bypass hum around D1.

53. The type of circuit shown in Figure E7-3 is a linear voltage regulator.

54. The purpose of C1 in the circuit shown in Figure E7-3 is to filter the supply voltage.

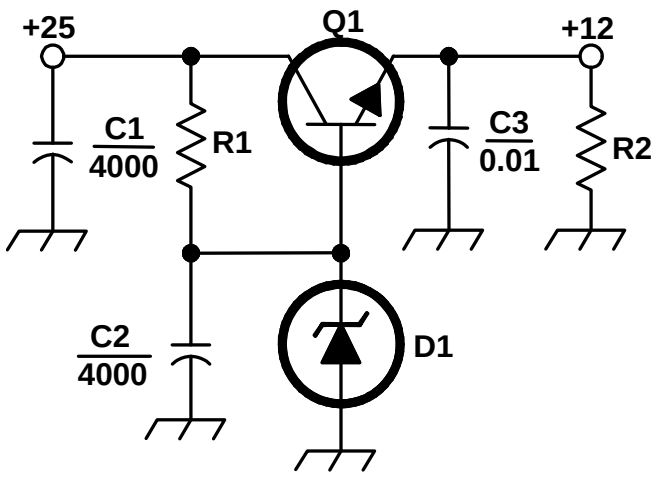
55. The purpose of C3 in the circuit shown in Figure E7-3 is to prevent self-oscillation.

56. The purpose of R1 in the circuit shown in Figure E7-3 is to supply current to D1.

57. The purpose of R2 in the circuit shown in Figure E7-3 is to provide a constant minimum load for Q1.

58. The purpose of D1 in the circuit shown in Figure E7-3 is to provide a voltage reference.

Figure E7- 3



59. One purpose of a "bleeder" resistor in a conventional (unregulated) power supply is to improve output voltage regulation.

60. The purpose of a "step-start" circuit in a high-voltage power supply is to allow the filter capacitors to charge gradually.

61. When several electrolytic filter capacitors are connected in series to increase the operating voltage of a power supply filter circuit, resistors should be connected across each capacitor to equalize, as much as possible, the voltage drop across each capacitor, to provide a safety bleeder to discharge the capacitors when the supply is off and to provide a minimum load current to reduce voltage excursions at light loads.

62. The primary reason that a high-frequency inverter type high-voltage power supply can be both less expensive and lighter in weight than a conventional power supply is because the high frequency inverter design uses much smaller transformers and filter components for an equivalent power output.

63. A reactance modulator on the oscillator can be used to generate FM-phone emissions.

64. The function of a reactance modulator is to produce PM signals by using an electrically variable inductance or capacitance.

65. The fundamental principle of a phase modulator is that it varies the tuning of an amplifier tank circuit to produce PM signals.

66. One way a single-sideband phone signal can be generated is by using a balanced modulator followed by a filter.

67. A pre-emphasis network is the circuit added to an FM transmitter to proportionally attenuate the lower audio frequencies.

68. A de-emphasis network is the circuit added to an FM receiver to restore attenuated lower audio frequencies.

69. One result of the process of mixing two signals is the creation of new signals at the sum and difference frequencies.

70. The principal frequencies that appear at the output of a mixer circuit are the original frequencies, and the sum and difference frequencies.

71. Spurious mixer products are generated when an excessive amount of signal energy reaches a mixer circuit.

72. The process of detection is the recovery of information from a modulated RF signal.

73. A diode detector functions by rectification and filtering of RF signals.

74. Product detector is well suited for demodulating SSB signals.

75. A frequency discriminator is a circuit for detecting FM signals.

76. The phasing or quadrature method describes a common means of generating a SSB signal when using digital signal processing.

77. “Direct conversion” when referring to a software defined receiver means the incoming RF is mixed to “baseband” for analog-to-digital conversion and subsequent processing.

78. The purpose of a prescaler circuit is to divide a higher frequency signal so a low-frequency counter can display the operating frequency.

79. A prescaler would be used to reduce a signal’s frequency by a factor of ten.

80. The function of a decade counter digital IC is to produce one output pulse for every ten input pulses.

81. Two flip-flops must be added to a 100-kHz crystal-controlled marker generator so as to provide markers at 50 and 25 kHz.

82. A 1 MHz oscillator and a decade counter can be combined to produce a 100 kHz fundamental signal with harmonics at 100 kHz intervals.

83. A crystal-controlled oscillator that generates a series of reference signals at known frequency intervals best describes a crystal marker generator.

84. A crystal oscillator followed by a frequency divider would be a good choice for generating a series harmonically related receiver calibration signals.

85. One purpose of a marker generator is to provide a means of calibrating a receiver's frequency settings.

86. The accuracy of a frequency counter is determined by the accuracy of the time base.

87. A conventional frequency counter determines the frequency of a signal by counting the number of input pulses occurring within a specific period of time.

88. The purpose of a frequency counter is to provide a digital representation of the frequency of a signal.

89. Period measurement is an alternate method of determining frequency, other than by directly counting input pulses that is used by some frequency counters.

90. An advantage of a period-measuring frequency counter over a direct-count type is that it provides improved resolution of signals within a comparable time period.

91. The gain and frequency characteristics of an op-amp RC active filter is determined by the values of capacitors and resistors external to the op-amp.

92. Ringing in a filter is caused by the frequency and phase response of the filter.

93. The advantages of using an op-amp instead of LC elements in an audio filter is that Op-amps exhibit gain rather than insertion loss.

94. A Polystyrene capacitor is the best type suited for use in high-stability op-amp RC active filter circuits.

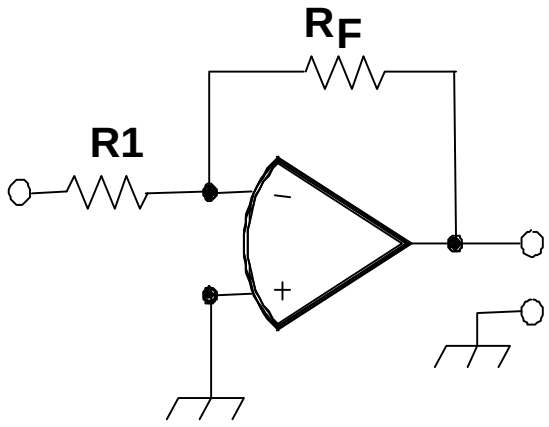
95. Unwanted ringing and audio instability can be prevented in a multi-section op-amp RC audio filter circuit by restricting both gain and Q.

96. When selecting the external components for an op-amp RC active filter, standard capacitor values are chosen first, the resistances are calculated, and resistors of the nearest standard value are used.

97. The most appropriate use of an op-amp RC active filter is as an audio receiving filter.

98. Sallen-Key is a type of active op-amp filter circuit.

Figure E7-4



99. A voltage gain of 47 can be expected from the circuit in Figure E7-4 when R1 is 10 ohms and RF is 470 ohms.

100. The gain of a theoretically ideal operational amplifier does not vary with frequency.

101. The voltage of the circuit shown in Figure E7-4 if R1 is 1000 ohms, RF is 10,000 ohms, and 0.23 volts is applied to the input is -2.3 volts

102. A voltage gain of 38 can be expected from the circuit in Figure E7-4 when R1 is 1800 ohms and RF is 68 kilohms.

103. A voltage gain of 14 can be expected from the circuit in Figure E7-4 when R1 is 3300 ohms and RF is 47 kilohms.

104. An operational amplifier is a high-gain, direct-coupled differential amplifier whose characteristics are determined by components external to the amplifier.

105. The term "op-amp input-offset voltage" means that the potential between the amplifier input terminals of the op-amp in a closed-loop condition.

106. The typical input impedance of an integrated circuit op-amp is very high.

107. The typical output impedance of an integrated circuit op-amp is very low.

108. The three major oscillator circuits often used in Amateur Radio equipment are Colpitts, Hartley and Pierce.

109. The condition that must exist for a circuit to oscillate is that it must have a positive feedback loop with a gain greater than 1.

110. Positive feedback is supplied in a Hartley oscillator through a tapped coil.

111. Positive feedback is supplied in a Colpitts oscillator through a capacitive divider.

112. Positive feedback is supplied in a Pierce oscillator through a quartz crystal.

113. Colpitts and Hartley are the type of oscillator circuits are commonly used in VFOs.

114. A magnetron oscillator is a UHF or microwave oscillator consisting of a diode vacuum tube with a specially shaped anode, surrounded by an external magnet.

115. A Gunn diode oscillator is an oscillator based on the negative resistance properties of properly-doped semiconductors.

116. A phase locked loop synthesizer is the type of frequency synthesizer circuit that uses a stable voltage-controlled oscillator, programmable divider, phase detector, loop filter and a reference frequency source.

117. A direct digital synthesizer is the type of frequency synthesizer circuit that uses a phase accumulator, lookup table, digital to analog converter and a low-pass anti-alias filter.

118. The information contained in the lookup table of a direct digital frequency synthesizer is the amplitude values that represent a sine-wave output.

119. The major spectral impurity components of direct digital synthesizers are spurs at discrete frequencies.

120. A Phase accumulator would be classified as a principal component of a direct digital synthesizer (DDS).

121. A Phase locked loop circuit is often used in conjunction with a direct digital synthesizer (DDS) to expand the available tuning range.

122. The capture range of a phase-locked loop circuit is the frequency range over which the circuit can lock.

123. A phase-locked loop circuit is an electronic servo loop consisting of a phase detector, a low-pass filter and voltage-controlled oscillator.

124. A phase-locked loop can frequency synthesis and FM demodulation.

125. A stable reference oscillator is normally used as part of a phase locked loop (PLL) frequency synthesizer because any phase variations in the reference oscillator signal will produce phase noise in the synthesizer output.

126. A phase-locked loop is often used as part of a variable frequency synthesizer for receivers and transmitters because it makes it possible for a VFO to have the same degree of stability as a crystal oscillator.

127. The major spectral impurity component of phase-locked loop synthesizers is its broadband noise.