

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Which of the following is NOT produced when two sine waves are combined through a nonlinear device?  
A) Harmonics of the two original frequencies  
B) Components of each of the two original frequencies  
C) Components at the sum and difference frequencies  
D) an ac level

Answer: D

- 2) Which of the following is considered a nonlinear device?  
A) Resistor                                      B) Transistor                                      C) Potentiometer                                      D) Capacitor

Answer: B

- 3) Which of the following modulation techniques is the most economical?  
A) Low-level                                      B) High-level                                      C) Ultra low-level                                      D) Medium-level

Answer: B

- 4) If the % modulation of an AM transmitter is 60% and the unmodulated antenna current is 10 A, what is the modulated current?  
A) 11 A                                      B) 5 A                                      C) 14 A                                      D) 13 A

Answer: A

- 5) If the carrier transmits 12 kW, what is the modulated power from Problem 4?  
A) 16 kW                                      B) 14 kW                                      C) 12 kW                                      D) 10 kW

Answer: B

- 6) The reason modulation is used in electronic communication is:  
A) Efficient transmission and reception of radio waves are not possible unless extremely large antennas are used.  
B) Since all intelligence signals occur at approximately the same frequency, there would be catastrophic interference problems if these frequencies were used.  
C) Audio frequency radio waves do not propagate long distances very reliably  
D) All of the above

Answer: D

- 7) Which of the following is not created by nonlinear mixing?  
A) dc (0 Hz)  
B) The sum and difference of the two original frequencies  
C) The original two frequencies  
D) Harmonics of the sum and difference frequencies

Answer: D

- 8) A 2 kHz sinewave is mixed with a 1.5 MHz carrier sinewave through a nonlinear device. Which frequency is not present in the output signal?  
A) 3 MHz                                      B) 1.498 MHz                                      C) 3.004 MHz                                      D) 1.502 MHz

Answer: C

- 9) A 2.5 MHz carrier is modulated by a music signal that has frequency components ranging from 100 Hz to 5 kHz. What is the range of frequencies generated for the upper sideband?  
A) 2.5 MHz to 2.505 MHz                                      B) 2.5001 MHz to 2.505 MHz  
C) 2.495 MHz to 2.499 MHz                                      D) 2.495 MHz to 2.505 MHz

Answer: B

- 10) Overmodulation:
- A) is undesirable because it produces sideband splatter.
  - B) results when the modulation index exceeds unity.
  - C) causes the AM signal to become distorted so that the receiver cannot produce a clean replica of the original intelligence signal.
  - D) all of the above.

Answer: D

- 11) The total output power of an AM transmitter that is being operated at 50% modulation is measured to be 1800 watts. What is the carrier power?
- A) 1440 watts                      B) 2025 watts                      C) 1600 watts                      D) 900 watts

Answer: C

- 12) A 250W carrier is to be modulated at an 85% modulation level. What is the total transmitted power?
- A) 356.3 watts                      B) 340.3 watts                      C) 183.7 watts                      D) 430.6 watts

Answer: B

- 13) An AM broadcast station operates at its maximum allowed output power of 80W at a percent modulation of 60%. What is the upper sideband power?
- A) 18.47 watts                      B) 12.2 watts                      C) 6.1 watts                      D) 9.23 watts

Answer: C

- 14) The antenna current of an AM transmitter is 5A when it is not modulated. It increases to 6A when it is modulated. Its modulation index expressed as a percentage is:
- A) 83.3%                      B) 93.8%                      C) 63.2%                      D) 69.4%

Answer: B

- 15) An intelligence signal is amplified by a 65% efficient amplifier before being combined with a 250W carrier to generate an AM signal. If it is desired to operate at 100% modulation, what must be the dc input power to the final intelligence signal amplifier?
- A) 192.3W                      B) 162.5W                      C) 83.3W                      D) 384.6W

Answer: A

- 16) High-level modulation is used:
- A) in high-power applications such as standard radio broadcasting.
  - B) when the intelligence signal is added to the carrier at the last possible point before the transmitting antenna.
  - C) when the transmitter must be made as power efficient as possible.
  - D) all of the above.

Answer: D

- 17) The process of neutralization is:
- A) a technique for filtering out all of the undesired frequencies produced by mixing action in a nonlinear amplifier except for the carrier, sum, and difference frequencies.
  - B) placing a negative feedback capacitor in an RF amplifier to reduce the tendency for self-oscillation.
  - C) the process of adjusting the percent modulation to its desired level in a modulator stage.
  - D) the process of adjusting the tank circuit so that the transmitter produces the proper output frequency.

Answer: B

- 18) The O.T.A. is:
- A) a linear integrated circuit that creates AM with an absolute minimum of design considerations.
  - B) an operational transconductance amplifier.
  - C) a special type of op amp used to create an AM signal.
  - D) all of the above.

Answer: D

- 19) The last stage of intelligence amplification before mixing with the carrier occurs in:
- A) the RF linear amplifier.
  - B) the modulated amplifier
  - C) the buffer.
  - D) the modulator.

Answer: D

- 20) The equation defining the AM envelope is
- A)  $e = E_c \sin \omega_c t$
  - B)  $e = E_i \sin \omega_i t + \sin \omega_c t$
  - C)  $e = E_c \sin \omega_c t + e = E_i \sin \omega_i t$
  - D)  $e = (E_c + E_i \sin \omega_i t) \sin \omega_c t$
  - E) none of the above

Answer: D

- 21) The result of the trigonometric identity  $(\sin x)(\sin y)$  is
- A)  $0.5 \cos(x-y) - 0.5 \cos(x+y)$
  - B)  $\cos(x-y) - \cos(x+y)$
  - C)  $-0.5 \cos(x-y) + 0.5 \cos(x+y)$
  - D)  $-0.5 \cos(x-y) + \cos(x+y)$
  - E) none of the above

Answer: A

- 22) The typical output impedance for an RF transmitter is
- A) 50
  - B) 8
  - C) 16
  - D) 75
  - E) none of the above

Answer: A

- 23) Determine the side frequency voltage if the modulation index is 70% and the carrier amplitude is 50V.
- A) 17.5
  - B) 50
  - C) 25
  - D) 35
  - E) none of the above

Answer: A