ARRL The national association for AMATEUR RADIO®

The ARRL Extra Class License Course

All You Need to Pass Your Extra Class Exam

LEVEL 3: Extra

For use with *The ARRL Extra Class License Manual*, 12th Edition

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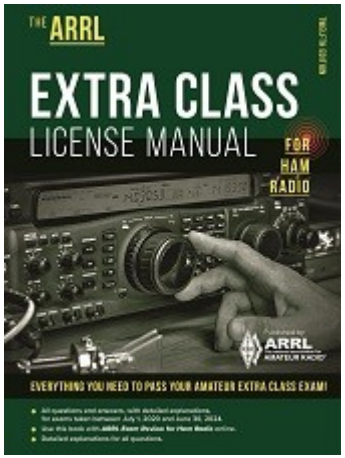

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What is the name of the process that shows that a square wave is made up of a sine wave plus all its odd harmonics?

A. Fourier analysis

B. Vector analysis

C. Numerical analysis

D. Differential analysis

E8A01 ECLM Page (7 - 8)

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(A) E8A01 ECLM Page (7 - 8)

Which of the following is a type of analog-to-digital conversion?

A. Successive approximation

B. Harmonic regeneration

C. Level shifting

D. Phase reversal

E8A02 ECLM Page (6 - 30)

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A. Successive approximation

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(A) E8A02 ECLM Page (6 - 30)

What type of wave does a Fourier analysis show to be made up of sine waves of a given fundamental frequency plus all its harmonics?

A. A sawtooth wave

B. A square wave

C. A sine wave

D. A cosine wave

E8A03 ECLM Page (7 - 9)

What type of wave does a Fourier analysis show to be made up of sine waves of a given fundamental frequency plus all its harmonics?

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(A) E8A03 ECLM Page (7 - 9)

What is "dither" with respect to analog -to-digital converters?

A. An abnormal condition where the converter cannot settle on a value to represent the signal

B. A small amount of noise added to the input signal to allow more precise representation of a signal over time

C. An error caused by irregular quantization step size

D. A method of decimation by randomly skipping samples

E8A04 ECLM Page (6 - 28)

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(B) E8A04 ECLM Page (6 - 28)

What of the following instruments would be the most accurate for measuring the RMS voltage of a complex waveform?

A. A grid dip meter

B. A D'Arsonval meter

C. An absorption wavemeter

D. A true-RMS calculating meter

E8A05 ECLM Page (7 - 2)

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(D) E8A05 ECLM Page (7 - 2)

What is the approximate ratio of PEP-to-average power in a typical single-sideband phone signal?

A. 2.5 to 1

B. 25 to 1

C. 1 to 1

D. 100 to 1

E8A06 ECLM Page (7 - 3)

What is the approximate ratio of PEP-to-average power in a typical single-sideband phone signal?

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(A) E8A06 ECLM Page (7 - 3)

What determines the PEP-to-average power ratio of a single-sideband phone signal?

A. The frequency of the modulating signal

B. Speech characteristics

C. The degree of carrier suppression

D. Amplifier gain

E8A07 ECLM Page (7 - 3)

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(B) E8A07 ECLM Page (7 - 3)

Why would a direct or flash conversion analog-to-digital converter be useful for a software defined radio?

A. Very low power consumption decreases frequency drift

B. Immunity to out of sequence coding reduces spurious responses

C. Very high speed allows digitizing high frequencies

D. All these choices are correct

E8A08 ECLM Page (6 - 29)

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(C) E8A08 ECLM Page (6 - 29)

How many different input levels can be encoded by an analog-to-digital converter with 8-bit resolution?

A. 8

B. 8 multiplied by the gain of the input amplifier

C. 256 divided by the gain of the input amplifier

D. 256

E8A09 ECLM Page (6 - 27)

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(D) E8A09 ECLM Page (6 - 27)

What is the purpose of a low pass filter used in conjunction with a digital-to-analog converter?

A. Lower the input bandwidth to increase the effective resolution

B. Improve accuracy by removing out of sequence codes from the input

C. Remove harmonics from the output caused by the discrete analog levels generated

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E8A10 ECLM Page (6 - 28)

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(C) E8A10 ECLM Page (6 - 28)

Which of the following is a measure of the quality of an analog-to-digital converter?

A. Total harmonic distortion

B. Peak envelope power

C. Reciprocal mixing

D. Power factor

E8A11 ECLM Page (6 - 28)

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(A) E8A11 ECLM Page (6 - 28)

What is the modulation index of an FM signal?

A. The ratio of frequency deviation to modulating signal frequency

B. The ratio of modulating signal amplitude to frequency deviation

C. The type of modulation used by the transmitter

D. The bandwidth of the transmitted signal divided by the modulating signal frequency

E8B01 ECLM Page (8 - 3)

What is the modulation index of an FM signal?

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(A) E8B01 ECLM Page (8 - 3)

How does the modulation index of a phase-modulated emission vary with RF carrier frequency?

A. It increases as the RF carrier frequency increases

B. It decreases as the RF carrier frequency increases

C. It varies with the square root of the RF carrier frequency

D. It does not depend on the RF carrier frequency

E8B02 ECLM Page (8 - 4)

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(D) E8B02 ECLM Page (8 - 4)

What is the modulation index of an FM-phone signal having a maximum frequency deviation of 3000 Hz either side of the carrier frequency, when the modulating frequency is 1000 Hz?

A. 3

B. 0.3

C. 3000

D. 1000

E8B03 ECLM Page (8 - 4)

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A. 3

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C. 3000

D. 1000

(A) E8B03 ECLM Page (8 - 4)

What is the modulation index of an FM-phone signal having a maximum carrier deviation of plus or minus 6 kHz when modulated with a 2-kHz modulating frequency?

A. 6000

B. 3

C. 2000

D. 1/3

E8B04 ECLM Page (8 - 4)

What is the modulation index of an FM-phone signal having a maximum carrier deviation of plus or minus 6 kHz when modulated with a 2-kHz modulating frequency?

A. 6000

B. 3

C. 2000

D. 1/3

(B) E8B04 ECLM Page (8 - 4)

What is the deviation ratio of an FM-phone signal having a maximum frequency swing of plus-or-minus 5 kHz when the maximum modulation frequency is 3 kHz?

A. 60

B. 0.167

C. 0.6

D. 1.67

E8B05 ECLM Page (8 - 3)

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(D) E8B05 ECLM Page (8 - 3)

What is the deviation ratio of an FM-phone signal having a maximum frequency swing of plus or minus 7.5 kHz when the maximum modulation frequency is 3.5 kHz?

A. 2.14

B. 0.214

C. 0.47

D. 47

E8B06 ECLM Page (8 - 3)

What is the deviation ratio of an FM-phone signal having a maximum frequency swing of plus or minus 7.5 kHz when the maximum modulation frequency is 3.5 kHz?

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B. 0.214

C. 0.47

D. 47

(A) E8B06 ECLM Page (8 - 3)

Orthogonal Frequency Division Multiplexing is a technique used for which type of amateur communication?

A. High-speed digital modes

B. Extremely low-power contacts

C. EME

D. OFDM signals are not allowed on amateur bands

E8B07 ECLM Page (8 - 14)

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(A) E8B07 ECLM Page (8 - 14)

What describes Orthogonal Frequency Division Multiplexing?

A. A frequency modulation technique that uses non-harmonically related frequencies

B. A bandwidth compression technique using Fourier transforms

C. A digital mode for narrow band, slow speed transmissions

D. A digital modulation technique using subcarriers at frequencies chosen to avoid intersymbol interference

E8B08 ECLM Page (8 - 14)

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(D) E8B08 ECLM Page (8 - 14)

What is deviation ratio?

A. The ratio of the audio modulating frequency to the center carrier frequency

B. The ratio of the maximum carrier frequency deviation to the highest audio modulating frequency

C. The ratio of the carrier center frequency to the audio modulating frequency

D. The ratio of the highest audio modulating frequency to the average audio modulating frequency

E8B09 ECLM Page (8 - 3)

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(B) E8B09 ECLM Page (8 - 3)

What is frequency division multiplexing?

A. The transmitted signal jumps from band to band at a predetermined rate

B. Two or more information streams are merged into a baseband, which then modulates the transmitter

C. The transmitted signal is divided into packets of information

D. Two or more information streams are merged into a digital combiner, which then pulse position modulates the transmitter

E8B10 ECLM Page (8 - 5)

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(B) E8B10 ECLM Page (8 - 5)

What is digital time division multiplexing?

A. Two or more data streams are assigned to discrete sub-carriers on an FM transmitter

B. Two or more signals are arranged to share discrete time slots of a data transmission

C. Two or more data streams share the same channel by transmitting time of transmission as the sub-carrier

D. Two or more signals are quadrature modulated to increase bandwidth efficiency

E8B11 ECLM Page (8 - 5)

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(B) E8B11 ECLM Page (8 - 5)

How is Forward Error Correction implemented?

A. By the receiving station repeating each block of three data characters

B. By transmitting a special algorithm to the receiving station along with the data characters

C. By transmitting extra data that may be used to detect and correct transmission errors

D. By varying the frequency shift of the transmitted signal according to a predefined algorithm

E8C01 ECLM Page (8 - 17)

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(C) E8C01 ECLM Page (8 - 17)

What is the definition of symbol rate in a digital transmission?

A. The number of control characters in a message packet

B. The duration of each bit in a message sent over the air

C. The rate at which the waveform changes to convey information

D. The number of characters carried per second by the station-to-station link

E8C02 ECLM Page (8 - 5)

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(C) E8C02 ECLM Page (8 - 5)

Why should phase-shifting of a PSK signal be done at the zero crossing of the RF signal?

A. To minimize bandwidth

B. To simplify modulation

C. To improve carrier suppression

D. All these choices are correct

E8C03 ECLM Page (8 - 11)

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(A) E8C03 ECLM Page (8 - 11)

What technique minimizes the bandwidth of a PSK31 signal?

A. Zero-sum character encoding

B. Reed-Solomon character encoding

C. Use of sinusoidal data pulses

D. Use of trapezoidal data pulses

E8C04 ECLM Page (8 - 11)

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D. Use of trapezoidal data pulses

(C) E8C04 ECLM Page (8 - 11)

What is the approximate bandwidth of a 13-WPM International Morse Code transmission?

A. 13 Hz

B. 26 Hz

C. 52 Hz

D. 104 Hz

E8C05 ECLM Page (8 - 9)

What is the approximate bandwidth of a 13-WPM International Morse Code transmission?

A. 13 Hz

B. 26 Hz

C. 52 Hz

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(C) E8C05 ECLM Page (8 - 9)

What is the bandwidth of a 170-hertz shift, 300-baud ASCII transmission?

A. 0.1 Hz

B. 0.3 kHz

C. 0.5 kHz

D. 1.0 kHz

E8C06 ECLM Page (8 - 10)

What is the bandwidth of a 170-hertz shift, 300-baud ASCII transmission?

A. 0.1 Hz

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C. 0.5 kHz

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(C) E8C06 ECLM Page (8 - 10)

What is the bandwidth of a 4800-Hz frequency shift, 9600-baud ASCII FM transmission?

A. 15.36 kHz

B. 9.6 kHz

C. 4.8 kHz

D. 5.76 kHz

E8C07 ECLM Page (8 - 10)

What is the bandwidth of a 4800-Hz frequency shift, 9600-baud ASCII FM transmission?

A. 15.36 kHz

B. 9.6 kHz

C. 4.8 kHz

D. 5.76 kHz

(A) E8C07 ECLM Page (8 - 10)

How does ARQ accomplish error correction?

A. Special binary codes provide automatic correction

B. Special polynomial codes provide automatic correction

C. If errors are detected, redundant data is substituted

D. If errors are detected, a retransmission is requested

E8C08 ECLM Page (8 - 17)

How does ARQ accomplish error correction?

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B. Special polynomial codes provide automatic correction

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(D) E8C08 ECLM Page (8 - 17)

Which digital code allows only one bit to change between sequential code values?

A. Binary Coded Decimal Code

B. Extended Binary Coded Decimal Interchange Code

C. Excess 3 code

D. Gray code

E8C09 ECLM Page (8 - 8)

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(D) E8C09 ECLM Page (8 - 8)

How may data rate be increased without increasing bandwidth?

A. It is impossible

B. Increasing analog-to-digital conversion resolution

C. Using a more efficient digital code

D. Using forward error correction

E8C10 ECLM Page (8 - 6)

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(C) E8C10 ECLM Page (8 - 6)

What is the relationship between symbol rate and baud?

A. They are the same

B. Baud is twice the symbol rate

C. Symbol rate is only used for packet-based modes

D. Baud is only used for RTTY

E8C11 ECLM Page (8 - 5)

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(A) E8C11 ECLM Page (8 - 5)

What factors affect the bandwidth of a transmitted CW signal?

A. IF bandwidth and Q

B. Modulation index and output power

C. Keying speed and shape factor (rise and fall time)

D. All these choices are correct

E8C12 ECLM Page (8 - 9)

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(C) E8C12 ECLM Page (8 - 9)