

Parte 1 de 3 - Preguntas de 1 puntos **3.0 / 3.0 Puntos**

Preguntas 1 de 8

1.0

1.0 Puntos

The Shannon theorem defines the capacity of a communication channel as the maximization of mutual information, $I(X;Y)$, under the constraint the output power $E[Y^2]$ is limited.

- ☐ Verdadero
- ☒ Falso

Preguntas 2 de 8

1.0

1.0 Puntos

The mutual information, $I(X;Y)$, between two alphabets, input X and output Y , related through communications in a discrete channel, is a part of the output alphabet entropy, $H(Y)$, which is common to a part of the input alphabet entropy, $H(X)$.

- ☒ Verdadero
- ☐ Falso

Preguntas 3 de 8

1.0

1.0 Puntos

The OSNR is specified for a noise bandwidth of:

- ☐ A. The signal symbol rate (R_s).
- ☐ B. The channel bandwidth (B)
- ☒ C. None of the other is correct.
- ☐ D. The signal spectral content at 3-dB bandwidth (W)

Parte 2 de 3 - Preguntas de 2 puntos **5.33 / 6.0 Puntos**

Preguntas 4 de 8

2.0

2.0 Puntos

What option is preferred to achieve a capacity of 3 bits/symbol with the lowest SNR?

- ☐ A. Use a single quadrature 4-ASK/2-PSK constellation
- ☒ B. use a two quadrature 16-QAM constellation leaving one bit/symbol as an overhead.

- ☐ C. Use a two quadrature 8-PSK constellation.
- ☐ D. use a two quadrature QPSK constellation.

☒ Preguntas 5 de 8 2.0

2.0 Puntos

☒ SNR_b = 9.5 dB, QPSK has a BER of approximately 1e-5. Check all that apply:

- A. No modulation with 3 bits/symbol outperforms OOK.
- B. OOK has a BER of approximately 1e-3.
- C. OOK has 1/2 the capacity of QPSK.
- ☒ D. BPSK has 2x the capacity of OOK.

Preguntas 6 de 8 1.33

2.0 Puntos

With respect to modulation constellations, check all that apply:

- ☒ A. It's key to compare modulations in terms of SNR per bit to understand the trade-off between complexity and capacity.
- B. For a target maximum capacity, one can use a larger modulation coded, at lower SNR, than a modulation with exactly the target capacity at larger SNR.
- ☒ C. Modulations using two quadratures approach the Shanon limit faster than those using just one quadrature.
- ☒ D. The capacity for all the modulations seen in the chapter converge to $\log_2(M)$ at large SNR.

Parte 3 de 3 - Preguntas de 0.5 puntos **1.0 / 1.0 Puntos**

Preguntas 7 de 8 0.5

0.5 Puntos

10 Information Theory part 12: Information Entropy (Claude Shannon's formula)

Entropy is a measure of information or uncertainty (how many yes/no questions to guess)

- ☒ Verdadero
- ☐ Falso



☒ preguntas 8 de 8

0.5

0.5 Puntos

07 Information Theory part 9: What is a bit? (check all that apply)



- A. The price of a message is related to how long does it takes to transmit
- B. Sources can be quantified and compared by the number of different messages they contain.
- C. The amount of information is given by entropy $H = n \log_2 s$ where n is number of symbols to be sent, and s is the number of different messages available in the message space

Parte 1 de 2 - Preguntas de 1.25 puntos **5.0 / 5.0 Puntos**

Preguntas 1 de 6	1.25	1.25 Puntos
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The equivalent low pass signal $x_b(t)$ is real

- ☐ Verdadero
- ☒ Falso

Preguntas 2 de 6	1.25	1.25 Puntos
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Two of these statements correspond to a 16-ASK/PSK constellation

- ☐ A. It has $16/2=8$ possible amplitude values in quadrature
- ☒ B. For $SNR_b=10$ (dB) and $SNR=5$ (dB) the capacities per symbol are 6 and 2 bits/symbol respectively
- ☐ C. If the amplitude corresponding to the outer ring is 1 then the amplitude of the smallest inner ring is 0.125.
- ☒ D. The capacity can be approximated by $C=\log_2(1+SNR)$ if $C<9$ bits/symbol.

Preguntas 3 de 6	1.25	1.25 Puntos
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The mutual information, $I(X;Y)$, between two alphabets, input X and output Y, related through communications in a discrete channel, is a part of the output alphabet entropy, $H(Y)$, which is common to a part of the input alphabet entropy, $H(X)$.

- ☒ Verdadero
- ☐ Falso

Preguntas 4 de 6	1.25	1.25 Puntos
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Is it correct to write the Shannon formula for the capacity of a channel (in bits/second) limited by thermal noise as: $C=\log_2[1+E/(k_bT)]$ where T is the temperature in °K and k_b is the Boltzman constant?

- ☒ Verdadero
- ☐ Falso

Parte 2 de 2 - Preguntas de 2 puntos **0.0 / 4.0 Puntos**

Preguntas 5 de 6	0.0	2.0 Puntos
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At $SNR_b = 9.5$ dB, QPSK has a BER of approximately $1e-5$. Check all that apply:

- ☐ A. OOK has 1/2 the capacity of QPSK.
- ☒ B. OOK has a BER of approximately $1e-3$.
- ☒ C. BPSK has 2x the capacity of OOK.
- ☐ D. No modulation with 3 bits/symbol outperforms OOK.

Preguntas 6 de 6	0.0	2.0 Puntos
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What option is preferred to achieve a capacity of 3 bits/symbol with the lowest SNR?

- ☒ A. Use a single quadrature 4-ASK/2-PSK constellation
- ☐ B. use a two quadrature 16-QAM constellation leaving one bit/symbol as an overhead.
- ☐ C. Use a two quadrature 8-PSK constellation.
- ☐ D. use a two quadrature QPSK constellation.

Preguntas 1 de 7

1.0 Puntos

Select two modulation formats with memory

- ☒ A. AMI
- ☐ B. VSB
- ☒ C. CSRZ
- ☐ D. C-RZ

Preguntas 2 de 7

1.0 Puntos

For a given bit rate R , the AMI format is more robust against chromatic dispersion than the RZ be

- ☐ Verdadero
- ☒ Falso

Preguntas 3 de 7

1.0 Puntos

Taking into account the limitation due to spectral narrowing, which of the following modulation formats is more robust?

- ☐ A. DB
- ☒ B. NRZ-DQPSK
- ☐ C. VSB-CSRZ
- ☐ D. NRZ-OOK

Preguntas 4 de 7

1.0 Puntos

NRZ-OOK is more tolerant to Polarization mode dispersion than any DPSK modulation format

- ☒ Verdadero
- ☐ Falso

Preguntas 5 de 7

2.0 Puntos

Caracteres aceptados: números, separadores decimales (punto o coma), indicadores de signo (-), "E" o "e" (usado en notación científica, ej., 5.3E-9). Los números complejos deben representarse usando esta expresión ($a + bi$) donde "a" y "b" deben tener necesariamente un valor. Ejemplo: $\{1+1i\}$ es válido mientras que $\{1+i\}$ no lo es. Igualmente, $\{0+9i\}$ es válido mientras que $\{9i\}$ no lo es.

The maximum allowable chromatic dispersion for a 2 dB penalty, 33% R-AMI at 42 Gb/s bit rate and a spectral bandwidth of 2 nm is 98 psec.

Preguntas 6 de 7

2.0 Puntos

Which of the following modulation formats require a pulse carver?

- ☐ A. DB
- ☒ B. 50% RZ-DPSK
- ☒ C. 33% RZ-AMI
- ☐ D. VSB-NRZ-OOK

Preguntas 7 de 7

2.0 Puntos

AMI requires data precoding plus an addition of the delayed precoded signal

- ☐ Verdadero
- ☒ Falso

Time Remaining: 00:29:27

▲ Hide Time Remaining ▲

Part 1 of 3 - Preguntas de 1 puntos

Question 1 of 8

1 Points

The mutual information, $I(X;Y)$, between two alphabets, input X and output Y , related through communications in a discrete channel, is a part of the output alphabet entropy, $H(Y)$, common to a part of the input alphabet entropy, $H(X)$.

☒ True

☐ False

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Time Remaining: 00:28:21

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Part 1 of 3 - Preguntas de 1 puntos

Question 2 of 8

1 Points

The Shannon theorem defines the capacity of a communication channel as the maximization of mutual information, $I(X;Y)$, under the constraint the output power $E[Y^*Y]$ is limited.

☐ True

☒ False

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Question 3 of 8

1 Points

Two of these statements correspond to a 16-ASK/PSK constellation

- ☐ A. It has $16/2=8$ possible amplitude values in quadrature
- ☐ B. The capacity can be approximated by $C=\log_2(1+\text{SNR})$ if $C < 9$ bits/symbol.
- ☐ C. For $\text{SNR}_b=10$ (dB) and $\text{SNR}=5$ (dB) the capacities per symbol are 6 and 2 bits/symbol respectively
- ☐ D. If the amplitude corresponding to the outer ring is 1 then the amplitude of the smallest inner ring is 0.125.

Question 4 of 8

2 Points

[Click to see additional instructions](#)

In a WDM system where channels transmit at a symbol rate of 10 Gb/s using square root raised cosine pulses ($\rho=0.3$) and the guard band is 20% of the channel spectral support, the spectral efficiency for SNR=20 dB is bits/sec/Hz

$$SE(\text{bits} / \text{sec} / \text{Hz}) = \frac{C}{B} = \frac{R_s}{B} \log_2 \left(1 + \frac{P}{N_o R_s} \right)$$

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Part 3 of 3 - Preguntas de 0.5 puntos

Question 7 of 8

0.5 Points

03 Information Theory part 3: What is coding theory? (check all that apply)

- ☐ A. Message sources are in practice discrete
- ☐ B. Noise usually forces to use some sort of line coding, so source messages are not send as they are, but transformed
- ☐ C. Source compression does not allow to send messages faster

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Choose two correct statements related to the model of an optical communication systems

- ☐ A. If the transmitter is single quadrature the receiver cannot use direct detection
- ☒ B. If the transmitter is single quadrature the receiver can use direct detection
- ☐ C. If the transmitter is I-Q the receiver uses direct detection
- ☒ D. If transmitter is I-Q the receiver uses coherent detection

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Question 8 of 8

0.5 Points

11 Information Theory part 13: Data Compression via Huffman Coding (check all that apply)

- ☒ A. The video shows how to coding can lead to source compression
- ☐ B. Source compression represents sending less source information per second.
- ☒ C. Source compression represents sending same source information per second using less bits.
- ☐ D. The limit for compression is related to the entropy of the source, so you can compress beyond the entropy of the source without losing information

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Submit for Grading

Question 6 of 8

2 Points

What option is preferred to achieve a capacity of 3 bits/symbol with the lowest SNR?

- ☐ A. Use a single quadrature 4-ASK/2-PSK constellation
- ☒ B. use a two quadrature 16-QAM constellation leaving one bit/symbol as an overhead.
- ☐ C. Use a two quadrature 8-PSK constellation.
- ☐ D. use a two quadrature QPSK constellation.

[Reset Selection](#)

