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NPTEL

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Courses » Information Theory, Coding and Cryptography

Announcements **Course** Ask a Question Progress Mentor FAQ

Unit 5 - Week 4

Assignment 4

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-09-05, 23:59 IST.

1) The capacity of Gaussian channel is *1 point*

- C= 2W $\log_2$ (1 + SNR) bits/s
- C= W$\log_{10}$ (1 + SNR) bits/s
- C= W $\log_2$ (1 + SNR) bits/s
- C= W(1 + SNR) bits/s

No, the answer is incorrect.
Score: 0

Accepted Answers:
C= W $\log_2$ (1 + SNR) bits/s

2) What assumption is made in the Information Capacity Theorem? *1 point*

- The input X(t) is band limited to W hertz
- The channel output is corrupted by AWGN of zero mean and power spectral density (psd) $N_0/2$.
- The transmitter is power-limited.
- All of the above

No, the answer is incorrect.
Score: 0

Accepted Answers:
All of the above

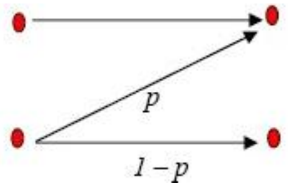
3) The Shannon Limit says that *1 point*

- For infinite bandwidth, the ratio E_b / N_0 tends to infinity.
- For infinite bandwidth, the ratio E_b / N_0 tends to 0.
- For infinite bandwidth, the ratio E_b / N_0 tends to 0.693.
- For infinite bandwidth, the ratio E_b / N_0 tends to 1.

No, the answer is incorrect.
Score: 0

Accepted Answers:
For infinite bandwidth, the ratio E_b / N_0 tends to 0.693.

4) Consider the Z channel shown below. If N such channels are cascaded, the combined channel can be represented by an equivalent Z channel with the channel transition probability *1 point*



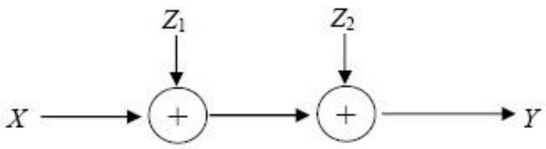
- $(p)^N$

- $(1 – p)^N$
- $p(1 – p)^N$
- $1 – (1 – p)^N$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$1 – (1 – p)^N$

5) Consider a communication system shown below with two Gaussian noise sources Z_1 and Z_2 that are independent, have zero mean and variances N_1 and N_2 respectively. Assuming that X is constrained to have power $E[X^2] = P$, the capacity is given by ***1 point***

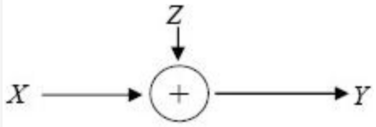


- $(½)\log(1 + P/(N_1 + N_2))$
- $\log(1 + 2P/(N_1 + N_2))$
- $(½)\log(1 + P/N_1 + P/N_2)$
- $\log(1 + P/N_1) + \log(1 + P/N_2)$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$(½)\log(1 + P/(N_1 + N_2))$

6) Consider the discrete memoryless channel shown below with source X = {0, 1} and an independent on-off jammer, Z, such that P(Z = 0) = P(Z = a) = 0.5. The capacity of this channel when a = -1 is ***1 point***



- 0 bit
- 0.1 bit
- 0.5 bit
- 1.0 bit

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.5 bit

7) Consider a channel consisting of two parallel AWGN channels with inputs X_1, X_2 and outputs $Y_1 = X_1 + Z_1$ and $Y_2 = X_2 + Z_2$. The noises Z_1 and Z_2 are independent and have variances N_1 and N_2 with $N_1 < N_2$. However, we are constrained to use the same symbol on both channels, i.e. $X_1 = X_2 = X$, where X is constrained to have power $E[X^2] = P$. Suppose at the receiver, we combine the outputs to produce $Y = Y_1 + Y_2$? The capacity C_1 of channel with input X and output Y is given by ***1 point***

- $(½)\log(1 + 4P/(N_1 + N_2))$
- $(½)\log(1 + 2P/(N_1 + N_2))$
- $\log(1 + P/(N_1 + N_2))$

(½)log(1 + P/(N_1 + N_2))

No, the answer is incorrect.
Score: 0

Accepted Answers:
(½)log(1 + 4P/(N_1 + N_2))

8) If the channel is known to the transmitter, the different scalar data pipes may be accessed individually through processing at the transmitter and receiver. The optimal energy can be found iteratively using the ***1 point***

- Successive approximation algorithm
- Water pouring algorithm
- Shannon'salgorithm
- Fano's algorithm

No, the answer is incorrect.
Score: 0

Accepted Answers:
Water pouring algorithm

9) ***1 point***

For a BSC, the cut-off rate is given by $R_0 = 1 - \log_2\left(1 + \sqrt{4p(1-p)}\right)$ where p is the crossover probability of the BSC. The value of p for which the cut-off rate minimum is

- 0
- 0.25
- 0.5
- 1

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.5

10)Consider a communication system using antipodal signaling and with SNR = 20 dB. The cutoff rate, R_0, for this system is given by ***1 point***

- 0.01
- 0.87
- 0.99
- 1.00

No, the answer is incorrect.
Score: 0

Accepted Answers:
0.99

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