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Unit 14 - Week 3 Assignments

Register for Certification exam

Course outline

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Matlab access and Learning Modules

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Assignment 3

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. **Due on 2019-02-27, 23:59 IST.**

1) Let $x = [1 \quad 1 \quad 0 \quad 1]$ be the polar transform of a vector $u = [u_1 \quad u_2 \quad u_3 \quad u_4]$. ***1 point***
Then $u =$

- $[1 \quad 1 \quad 0 \quad 1]$
- $[1 \quad 0 \quad 1 \quad 1]$
- $[0 \quad 1 \quad 0 \quad 1]$
- $[1 \quad 0 \quad 1 \quad 0]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[1 \quad 0 \quad 1 \quad 1]$

2) Let $G_2 = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$, $G_{2^n} = {G_2}^{\otimes n}$ where $\otimes$ is the Kronecker product or the tensor product. The number of ones and the number of zeros in G_{2^n} are respectively, ***1 point***

- $2^n, 2^n$
- $3^n, 3^{2n} - 3^n$
- $3^n, 2^{2n} - 3^n$
- $2^{2n}, 2^n, 2^n$

The reliability sequence for the code is $[1 \quad 2 \quad 3 \quad 5 \quad 4 \quad 6 \quad 7 \quad 8]$. If $m = [0 \quad 1 \quad 1 \quad 1]$ is the message to be transmitted, then the codeword input to the BPSK-AWGN channel is

- $[0 \quad 1 \quad 1 \quad 1 \quad 0 \quad 1 \quad 0 \quad 0]$
- $[1 \quad 0 \quad 0 \quad 1 \quad 1 \quad 0 \quad 0 \quad 1]$
- $[0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1 \quad 1 \quad 1]$
- $[0 \quad 1 \quad 1 \quad 0 \quad 1 \quad 0 \quad 0 \quad 0]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[1 \quad 0 \quad 0 \quad 1 \quad 1 \quad 0 \quad 0 \quad 1]$

4) The number of nodes at depth 3 of a binary tree is ____

No, the answer is incorrect.
Score: 0

Accepted Answers:
(Type: Numeric) 8

1 point

5) Consider the successive cancellation decoder for a polar code with codeword length 2^n. ***1 point***
The size of the belief vector received by the fifth node at depth r is

- $\frac{2^n}{r}$
- $2(n-r)$
- 2^r
- 2^{n-r}

No, the answer is incorrect.
Score: 0

Accepted Answers:
2^{n-r}

Use the following information for questions 6 to 8: Consider the decoding of a received vector from a polar code using successive cancellation decoder on a binary tree. Let $[0.8 \quad 2.0 \quad 0.6 \quad -2.2 \quad -1.25 \quad 1.3 \quad -1.5 \quad -1.8]$ be the belief vector received by an interior node, say node A.

6) The belief vector passed by node A to its left child node is ***1 point***

- $[1.25 \quad 1.3 \quad -1.5 \quad 0.8]$

$[-0.8 \quad 1.3 \quad -0.6 \quad 1.8]$

$[-1.25 \quad 1.3 \quad 1.5 \quad -0.8]$

$[0.8 \quad 1.3 \quad 0.6 \quad -1.8]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[-0.8 \quad 1.3 \quad -0.6 \quad 1.8]$

7) Let $u = [0 \quad 1 \quad 0 \quad 1]$ be the hard-decision vector returned to node A by its left child node. Then the belief vector passed by node A to its right child node is ***1 point***

$[-1.25 \quad 1.3 \quad -1.5 \quad -1.8]$

$[-2.05 \quad 3.3 \quad -2.1 \quad -4.0]$

$[-0.45 \quad -0.7 \quad -0.9 \quad 0.4]$

$[-0.8 \quad 1.3 \quad -0.6 \quad 1.8]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[-0.45 \quad -0.7 \quad -0.9 \quad 0.4]$

8) Let $v = [1 \quad 0 \quad 0 \quad 1]$ be the hard-decision vector returned to node A by its right child node. Then the hard-decision vector returned by node A to its parent node is ***1 point***

$[0 \quad 0 \quad 1 \quad 1]$

$[1 \quad 1 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 1]$

$[1 \quad 1 \quad 0 \quad 0]$

$[0 \quad 1 \quad 0 \quad 1 \quad 1 \quad 1 \quad 0 \quad 0]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[1 \quad 1 \quad 0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 1]$

Use the following information for questions 9 to 12: Consider a coded-BPSK transmission over an AWGN channel using the (16,8) polar code constructed using the reliability sequence as given in 5G Standard(link to reliability_sequence.txt). The received vector is provided in received_vector.txt. Consider decoding the received vector using the successive cancellation decoder(as explained in the lectures). The nodes at each layer are numbered from left to right starting from 0. A node can be uniquely indexed by specifying the depth and the node number.

9) The frozen bit positions in this code will be: ***1 point***

$[1 \quad 2 \quad 3 \quad 4 \quad 5 \quad 6 \quad 7 \quad 8]$

$[1 \quad 2 \quad 3 \quad 5 \quad 9 \quad 4 \quad 6 \quad 10]$

$[7 \quad 11 \quad 13 \quad 8 \quad 12 \quad 14 \quad 15 \quad 16]$

$[9 \quad 10 \quad 11 \quad 12 \quad 13 \quad 14 \quad 15 \quad 16]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[1 \quad 2 \quad 3 \quad 5 \quad 9 \quad 4 \quad 6 \quad 10]$

10) The belief vector received by node 0 at depth 2 is: ***1 point***

$[0.2920 \quad 0.9709 \quad 0.5830 \quad 0.5973]$

$[0.6170 \quad 1.0100 \quad 0.5830 \quad 0.9309 \quad 0.2920 \quad 0.9709 \quad 1.0729 \quad 0.5973]$

$[3.6394 \quad -5.1449 \quad -4.0993 \quad -5.6242]$

$[0.6170 \quad -1.5227 \quad -0.6619 \quad -0.9309]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[0.2920 \quad 0.9709 \quad 0.5830 \quad 0.5973]$

11) The belief vector passed by node 1 at depth 1 to its right child is: ***1 point***

$[1.2999 \quad 2.5328 \quad 1.2449 \quad 2.0872]$

$[0.9090 \quad 1.9810 \quad 1.6559 \quad 1.5283]$

$[-1.0397 \quad -0.0794 \quad -1.6095 \quad 1.4499]$

$[3.6394 \quad -5.1449 \quad -4.0993 \quad -5.6242]$

No, the answer is incorrect.
Score: 0

Accepted Answers:
$[3.6394 \quad -5.1449 \quad -4.0993 \quad -5.6242]$

12) The decoded message is: ***1 point***

$[0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0]$

$[0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0]$

$[0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1]$

$[1 \quad 0 \quad 0 \quad 1 \quad 1 \quad 0 \quad 0 \quad 0]$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$[0 \quad 0 \quad 1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 1]$

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