Started on	Friday, 3 November 2023, 10:36 PM
State	Finished
Completed on	Friday, 3 November 2023, 10:40 PM
Time taken	4 mins 17 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Flag question

Channel equalization refers to

Select one:

- ○ Making all the channel gains equal
- ◉ Removing the effect of ISI ✔
- ○ Making all the transmit powers equal
- ○ Making the channels of different users equal

Your answer is correct.

The correct answer is: Removing the effect of ISI

Question **2**

Correct

Mark 1.00 out of 1.00

Flag question

Consider an Inter Symbol Interference channel $y(k) = x(k) + \frac{1}{3}x(k-1) + v(k)$. Let an $r = 2$ tap channel equalizer be designed for this scenario based on symbols $y(k), y(k+1)$ to detect $x(k)$. Let the equalizer vector be denoted by $\bar{\mathbf{c}}$. The least squares problem for estimation of $\bar{\mathbf{c}}$ is,

Select one:

- ○ $\left\| \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ \frac{1}{3} & 1 \\ 0 & \frac{1}{3} \end{bmatrix} \bar{\mathbf{c}} \right\|^2$
- ○ $\left\| \begin{bmatrix} 0 \\ 1 \end{bmatrix} - \begin{bmatrix} \frac{1}{3} & 1 & 0 \\ 0 & \frac{1}{3} & 1 \end{bmatrix} \bar{\mathbf{c}} \right\|^2$
- ○ $\left\| \begin{bmatrix} 0 \\ 1 \end{bmatrix} - \begin{bmatrix} 1 & \frac{1}{3} \\ 1 & \frac{1}{3} \end{bmatrix} \bar{\mathbf{c}} \right\|^2$
- ◉ $\left\| \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ \frac{1}{3} & 1 \\ 0 & \frac{1}{3} \end{bmatrix} \bar{\mathbf{c}} \right\|^2$ ✔

Your answer is correct.

The correct answer is: $\left\| \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} - \begin{bmatrix} 1 & 0 \\ \frac{1}{3} & 1 \\ 0 & \frac{1}{3} \end{bmatrix} \bar{\mathbf{c}} \right\|^2$

Question **3**

Correct

Mark 1.00 out of 1.00

Flag question

Consider an Inter Symbol Interference channel $y(k) = x(k) + \frac{1}{3}x(k-1) + v(k)$. Let an $r = 2$ tap channel equalizer be designed for this scenario based on symbols $y(k), y(k+1)$ to detect $x(k)$. Let the equalizer vector be denoted by $\bar{\mathbf{c}}$. The zero-forcing (ZF) equalizer vector $\bar{\mathbf{c}}$ is,

Select one:

- $\frac{3}{89}\begin{bmatrix} 1 \\ 63 \end{bmatrix}$
- $\frac{9}{91}\begin{bmatrix} 1 \\ 27 \end{bmatrix}$
- $\frac{3}{91}\begin{bmatrix} 1 \\ 27 \end{bmatrix}$ ✔
- $\frac{6}{91}\begin{bmatrix} 1 \\ 81 \end{bmatrix}$

Your answer is correct.

The correct answer is: $\frac{3}{91}\begin{bmatrix} 1 \\ 27 \end{bmatrix}$

Question **4**

Correct

Mark 1.00 out of 1.00

Flag question

Consider an Inter Symbol Interference channel $y(k) = h(0)x(k) + h(1)x(k-1) + v(k)$. Let an $r = 2$ tap channel equalizer be designed for this scenario based on symbols $y(k), y(k+1)$ to detect $x(k)$. Let the equalizer vector be denoted by $\mathbf{c}$ and the effective channel matrix by $\mathbf{H}$. The matrix $\mathbf{H}$ for this scenario is

Select one:

- $\begin{bmatrix} h(0) & h(1) \\ h(1) & h(0) \end{bmatrix}$
- $\begin{bmatrix} h(1) & h(0) & 0 \\ 0 & h(1) & h(0) \end{bmatrix}$
- $\begin{bmatrix} h(0) & h(1) & 0 \\ 0 & h(0) & h(1) \end{bmatrix}$ ✔
- $\begin{bmatrix} h(0) & h(1) \\ h(0) & h(1) \end{bmatrix}$

Your answer is correct.

The correct answer is: $\begin{bmatrix} h(0) & h(1) & 0 \\ 0 & h(0) & h(1) \end{bmatrix}$

Question **5**

Correct

Mark 1.00 out of 1.00

Flag question

Consider an Inter Symbol Interference channel $y(k) = h(0)x(k) + h(1)x(k-1) + v(k)$. Let an $r = 2$ tap channel equalizer be designed for this scenario based on symbols $y(k)$, $y(k+1)$ to detect $x(k)$. Let the equalizer vector be denoted by $\bar{\mathbf{c}}$ and the effective channel matrix by $\mathbf{H}$. The least squares problem for estimation of $\bar{\mathbf{c}}$ is,

Select one:

- $\left\| \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} - \mathbf{H}^T \bar{\mathbf{c}} \right\|^2$ ✔
- $\left\| \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} - \mathbf{H}^T \bar{\mathbf{c}} \right\|^2$
- $\left\| \begin{bmatrix} 0 \\ 1 \end{bmatrix} - \mathbf{H} \bar{\mathbf{c}} \right\|^2$
- $\left\| \begin{bmatrix} 0 \\ 1 \end{bmatrix} - \begin{bmatrix} h(0) & h(1) \\ h(0) & h(1) \end{bmatrix} \bar{\mathbf{c}} \right\|^2$

Your answer is correct.

The correct answer is: $\left\| \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} - \mathbf{H}^T \bar{\mathbf{c}} \right\|^2$

Question **6**

Correct

Mark 1.00 out of 1.00

Flag question

Consider an Inter Symbol Interference channel $y(k) = h(0)x(k) + h(1)x(k-1) + v(k)$. Let an $r = 2$ tap channel equalizer be designed for this scenario based on symbols $y(k)$, $y(k+1)$ to detect $x(k)$. Let the equalizer vector be denoted by $\bar{\mathbf{c}}$ and the effective channel matrix by $\mathbf{H}$. The zero-forcing (ZF) equalizer vector $\bar{\mathbf{c}}$ is,

Select one:

- $(\mathbf{H}^T\mathbf{H})^{-1}\mathbf{H}^T \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$
- $(\mathbf{H}^T\mathbf{H})^{-1}\mathbf{H}^T \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$
- $\mathbf{H}^T(\mathbf{H}\mathbf{H}^T)^{-1} \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$
- $(\mathbf{H}\mathbf{H}^T)^{-1}\mathbf{H} \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$ ✔

Your answer is correct.

The correct answer is: $(\mathbf{H}\mathbf{H}^T)^{-1}\mathbf{H} \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$

Question **7**

Correct

Mark 1.00 out of 1.00

Flag question

Consider an Inter Symbol Interference channel $y(k) = h(0)x(k) + h(1)x(k-1) + v(k)$. Let an $r = 2$ tap channel equalizer be designed for this scenario based on symbols $y(k), y(k+1)$ to detect $x(k)$. Let the effective channel matrix for this scenario be denoted by $\mathbf{H}$. The projection matrix $\mathbf{P_H}$ of $\mathbf{H}^T$ is,

Select one:

- $\mathbf{H}^T(\mathbf{H}^T\mathbf{H})^{-1}\mathbf{H}$
- $\mathbf{H}^T(\mathbf{H}\mathbf{H}^T)^{-1}\mathbf{H}$ ✔
- $(\mathbf{H}^T\mathbf{H})^{-1}$
- $\mathbf{H}(\mathbf{H}^T\mathbf{H})^{-1}\mathbf{H}^T$

Your answer is correct.

The correct answer is: $\mathbf{H}^T(\mathbf{H}\mathbf{H}^T)^{-1}\mathbf{H}$

Question **8**

Correct

Mark 1.00 out of 1.00

Flag question

Which of the following standards is not based on Orthogonal Frequency Division Multiplexing (OFDM)

Select one:

- 802.11n
- WCDMA ✔
- LTE
- WiMAX

Your answer is correct.

The correct answer is: WCDMA

Question **9**

Correct

Mark 1.00 out of 1.00

Flag question

ISI in a wireless system results when

Select one:

- Symbol duration is very large
- Velocity of the mobile is large
- Velocity of the mobile is small
- Symbol duration is very small ✔

Your answer is correct.

The correct answer is: Symbol duration is very small

Question **10**

Correct

Mark 1.00 out of 1.00

Flag question

In an OFDM system, after addition of the cyclic prefix, which of the following statements is true

Select one:

- (selected) The output time-domain samples are a circular convolution between the channel filter and the time-domain transmit samples obtained after IFFT ✔
- The output symbols across the subcarriers are a linear convolution between the channel filter and the time-domain transmit samples obtained after IFFT
- The output symbols across the subcarriers are a circular convolution between the channel filter and the transmit symbols loaded on the subcarriers
- The output time-domain samples are a multiplication of the FFT coefficients of the channel filter and the time-domain transmit samples obtained after IFFT

Your answer is correct.

The correct answer is: The output time-domain samples are a circular convolution between the channel filter and the time-domain transmit samples obtained after IFFT

Save the state of the flags

Finish review