Assignment-2

The due date for submitting this assignment has passed.

Due on 2021-02-07, 23:59 IST.

As per our records you have not submitted this assignment.

1) Beamforming is a technique that can be used in *1 point*

- Machine Learning
- Wireless systems
- Data Analytics
- Medical technology

No, the answer is incorrect.
Score: 0
Accepted Answers:
Wireless systems

2) Consider a multiple receive antenna wireless system with channel vector below *1 point*

$$\vec{\mathbf{h}} = \begin{bmatrix} \frac{1}{\sqrt{2}} - j\frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} - j\frac{1}{\sqrt{2}} \end{bmatrix}$$

The Maximal Ratio Combiner (MRC) for this system, as defined in the lectures, is given as

- $\begin{bmatrix} \frac{1}{2} + j\frac{1}{2} \\ -\frac{1}{2} + j\frac{1}{2} \end{bmatrix}$
- $\begin{bmatrix} -\frac{1}{2} - j\frac{1}{2} \\ \frac{1}{2} - j\frac{1}{2} \end{bmatrix}$
- $\begin{bmatrix} \frac{1}{\sqrt{2}} + j\frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} + j\frac{1}{\sqrt{2}} \end{bmatrix}$
- $\begin{bmatrix} \frac{1}{2} - j\frac{1}{2} \\ -\frac{1}{2} - j\frac{1}{2} \end{bmatrix}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\begin{bmatrix} \frac{1}{2} - j\frac{1}{2} \\ -\frac{1}{2} - j\frac{1}{2} \end{bmatrix}$

3) Two matrices $\mathbf{A}$ of size $m \times n$ and $\mathbf{B}$ of size $p \times q$ can be multiplied to form the product $\mathbf{AB}$ *1 point*

- only when $m = p$ and $n = q$
- only when $n = p$, and arbitrary values of m, q
- only when $m = q$, and arbitrary values of n, p
- For any values of m, n, p, q

No, the answer is incorrect.
Score: 0
Accepted Answers:
only when $n = p$, and arbitrary values of m, q

4) Vectors $\vec{\mathbf{a}}_1, \vec{\mathbf{a}}_2, \cdots, \vec{\mathbf{a}}_n$ are linearly independent when *1 point*

- $\alpha_1\vec{\mathbf{a}}_1 + \alpha_2\vec{\mathbf{a}}_2 + \cdots + \alpha_n\vec{\mathbf{a}}_n = 0 \Leftrightarrow \alpha_1 = \alpha_2 = \cdots = 0$
- $\alpha_1 = \alpha_2 = \cdots = 0 \Rightarrow \alpha_1\vec{\mathbf{a}}_1 + \alpha_2\vec{\mathbf{a}}_2 + \cdots + \alpha_n\vec{\mathbf{a}}_n = 0$
- There exist $\alpha_1, \alpha_2, \cdots, \alpha_n$, not all zero, such that $\alpha_1\vec{\mathbf{a}}_1 + \alpha_2\vec{\mathbf{a}}_2 + \cdots + \alpha_n\vec{\mathbf{a}}_n = 0$
- There exist $\alpha_1, \alpha_2, \cdots, \alpha_n$, not all zero, such that $\alpha_1\vec{\mathbf{a}}_1 + \alpha_2\vec{\mathbf{a}}_2 + \cdots + \alpha_n\vec{\mathbf{a}}_n \neq 0$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\alpha_1\vec{\mathbf{a}}_1 + \alpha_2\vec{\mathbf{a}}_2 + \cdots + \alpha_n\vec{\mathbf{a}}_n = 0 \Leftrightarrow \alpha_1 = \alpha_2 = \cdots = 0$

5) The rank of a matrix is *1 point*

- The minimum number of linearly independent columns
- The maximum number of linearly dependent columns
- The maximum number of linearly independent columns
- The minimum number of linearly dependent columns

No, the answer is incorrect.
Score: 0
Accepted Answers:
The maximum number of linearly independent columns

6) The rank of the matrix $\mathbf{A}$ given below is *1 point*

$$\mathbf{A} = \begin{bmatrix} -2 & 1 & -3 \\ -1 & 5 & 7 \\ -3 & -3 & -13 \end{bmatrix}$$

- 0
- 1
- 2
- 3

No, the answer is incorrect.
Score: 0
Accepted Answers:
2

7) Which of the following conditions imply that matrix $\mathbf{A}$ of size $n \times n$ is invertible *1 point*

- only $\text{rank}(\mathbf{A}) = n$
- only $\det(\mathbf{A}) \neq 0$
- only $\mathbf{A}\vec{\mathbf{x}} = 0 \Leftrightarrow \vec{\mathbf{x}} = 0$
- All of these

No, the answer is incorrect.
Score: 0
Accepted Answers:
All of these

8) Matrix that is NOT invertible is termed a *1 point*

- Singular matrix
- Poor matrix
- Linearly independent matrix
- Orthogonal matrix

No, the answer is incorrect.
Score: 0
Accepted Answers:
Singular matrix

9) Let $\mathbf{C}$ denote the matrix of cofactors for $\mathbf{A}$. Then, the adjoint of $\mathbf{A}$, denoted by $\text{adj}(\mathbf{A})$, is given as *1 point*

- $\mathbf{C}^T$
- $-\boldsymbol{C}$
- $\frac{\mathbf{C}}{|\mathbf{C}|}$
- $\mathbf{C}^{-1}$

No, the answer is incorrect.
Score: 0
Accepted Answers:
$\mathbf{C}^T$

10) Consider the $r \times t$ MIMO channel matrix $\mathbf{H}$. The (i, j) element of $\mathbf{H}$, represented by $h_{i,j}$, denotes the channel between *1 point*

- Receive antenna j and transmit antenna i
- Frequency band j and transmit antenna i
- Receive antenna j and frequency band i
- Receive antenna i and transmit antenna j

No, the answer is incorrect.
Score: 0
Accepted Answers:
Receive antenna i and transmit antenna j