

Course outline

How does an NPTEL online course work?

Week-0

Week-1

Week-2

Week-3

- Lec 11- Gram-Schmidt Orthogonalization
- Lec 12- Gaussian Random Variable: Definition, Mean, Variance, Multivariate Gaussian, Covariance Matrix
- Lec 13- Linear Transformation of Gaussian Random Vectors
- Lec 14- Machine Learning Application: Gaussian Classification
- Lec 15- Eigenvalue: Definition, Characteristic Equation, Eigenvalue Decomposition
- Lec 16- Special Matrices: Rotation and Unitary Matrices, Application: Alamouti Code

 Quiz : Assignment-3

 Feedback For Week 3

 Solution-3

Week-4

Week-5

Week-6

Week-7

Week-8

Week-9

Week-10

Week-11

Week-12

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Assignment-3

The due date for submitting this assignment has passed.

Due on 2021-02-10, 23:59 IST.

As per our records you have not submitted this assignment.

 1) Consider a matrix of size 2×5 . The Rank+Nullity of this matrix equals

1 point

-
- 2
-
-
- 5
-
-
- 7
-
-
- 3

No, the answer is incorrect.

Score: 0

Accepted Answers: 5

2) Consider the vectors below

1 point

$$\bar{x}_1 = \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \bar{x}_2 = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$$

Using the Gram-Schmidt procedure, a set of orthonormal basis vectors for the same subspace is given as

$$\bar{v}_1 = \frac{1}{2} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \bar{v}_2 = \frac{1}{2\sqrt{5}} \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$$

$$\bar{v}_1 = \frac{1}{2} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \bar{v}_2 = \frac{1}{\sqrt{18}} \begin{bmatrix} -3 \\ 2 \\ 1 \\ -2 \end{bmatrix}$$

$$\bar{v}_1 = \frac{1}{2} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \bar{v}_2 = -\frac{1}{2} \begin{bmatrix} 1 \\ -1 \\ -1 \\ 1 \end{bmatrix}$$

$$\bar{v}_1 = \frac{1}{2} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \bar{v}_2 = \frac{1}{2\sqrt{5}} \begin{bmatrix} -3 \\ -1 \\ 1 \\ 3 \end{bmatrix}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\bar{v}_1 = \frac{1}{2} \begin{bmatrix} 1 \\ 1 \\ 1 \\ 1 \\ 1 \end{bmatrix}, \bar{v}_2 = \frac{1}{2\sqrt{5}} \begin{bmatrix} -3 \\ -1 \\ 1 \\ 3 \end{bmatrix}$$

 3) Consider the matrix A given below

1 point

$$A = \begin{bmatrix} 1 & 1 & 1 & 1 & 1 \\ 1 & 2 & 3 & 4 & 5 \end{bmatrix}$$

 Which of the vectors below lie in the null space of the matrix A ?

$$\begin{bmatrix} -3 \\ -1 \\ 2 \\ 1 \\ -1 \end{bmatrix}$$

$$\begin{bmatrix} 2 \\ -3 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} 2 \\ -3 \\ -1 \\ 1 \\ 1 \end{bmatrix}$$

$$\begin{bmatrix} -2 \\ 3 \\ -2 \\ -1 \\ 2 \end{bmatrix}$$

No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\begin{bmatrix} 2 \\ -3 \\ 0 \\ 1 \\ 0 \end{bmatrix}$$

4) Kirchoff's voltage law states that

1 point

-
- Net voltage drop across a node is zero
-
-
- Net current entering a node equals 0
-
-
- Net voltage drop across a closed loop is zero
-
-
- Net current across a closed loop is zero

No, the answer is incorrect.

Score: 0

Accepted Answers:

Net voltage drop across a closed loop is zero

 5) Consider the adjacency matrix M for a directed graph used to represent a social network as described in the lectures. The elements $[M]_{i,j}$ are defined as

1 point

$$[M]_{i,j} = 1$$

 $[M]_{i,j} = 1$ if there is a directed edge from node i to node j and 0 otherwise

 $[M]_{i,j} = 1$ if there is a directed edge from node j to node i and 0 otherwise

 $[M]_{i,j} = 1$ if there is a directed edge from node i to node j , or node j to node i , and 0 otherwise

No, the answer is incorrect.

Score: 0

Accepted Answers:

 $[M]_{i,j} = 1$ if there is a directed edge from node i to node j and 0 otherwise

 6) Consider the adjacency matrix M for a directed graph used to represent a social network as described in the lectures. The number of r step connections from node i to node j is given as

1 point

$$[M^r]_{i,j}$$

$$[rM]_{i,j} = 1$$

$$[M^{r-1}]_{i,j}$$

$$[\frac{M}{r}]_{i,j}$$

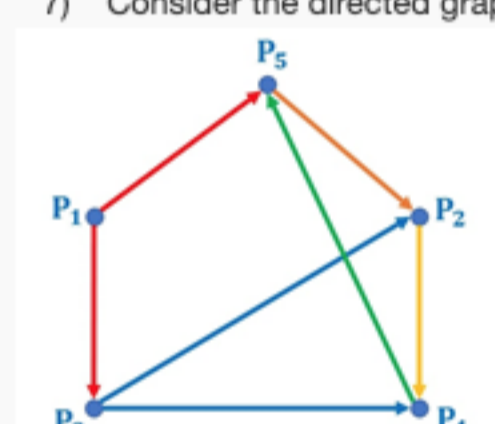
No, the answer is incorrect.

Score: 0

Accepted Answers:

$$[M^r]_{i,j}$$

7) Consider the directed graph below

1 point


The adjacency matrix for this graph is given as

$$\begin{bmatrix} 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

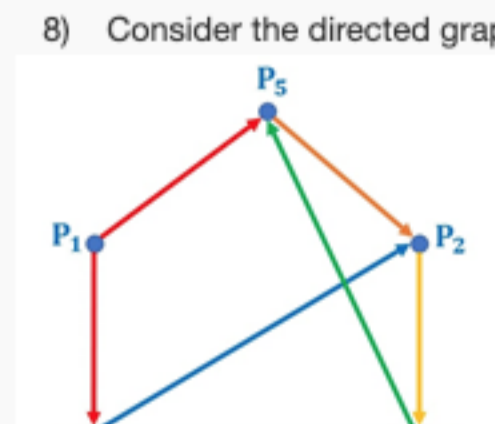
No, the answer is incorrect.

Score: 0

Accepted Answers:

$$\begin{bmatrix} 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

8) Consider the directed graph below

1 point

 The number of 2-step connections for this graph from node P_1 to node P_2 is given as

 0

 1

 2

 3

No, the answer is incorrect.

Score: 0

Accepted Answers:

2

9) A dominance directed graph is one in which

1 point

-
- Between any pair of nodes
- P_i, P_j
- , there is an edge from
- P_i
- to
- P_j
- or
- P_j
- to
- P_i
- , or both
-
-
- Between any pair of nodes
- P_i, P_j
- , there is an edge from
- P_i
- to
- P_j
- and
- P_j
- to
- P_i
-
-
- Between any pair of nodes
- P_i, P_j
- , there is an edge from
- P_i
- to
- P_j
- or
- P_j
- to
- P_i
- , or none
-
-
- Between any pair of nodes
- P_i, P_j
- , there is an edge from
- P_i
- to
- P_j
- or
- P_j
- to
- P_i
- , but not both

No, the answer is incorrect.

Score: 0

Accepted Answers:

 Between any pair of nodes P_i, P_j , there is an edge from P_i to P_j or P_j to P_i , but not both

 10) Let M denote the adjacency matrix of a dominance directed graph. The most influential node is P_i if

1 point

 Row i has the largest sum in M^2

 Row i has the largest sum in M

 Row i has the largest sum in $M^2 + M$

 Row i has the largest sum in $M^3 + M^2 + M$

No, the answer is incorrect.

Score: 0

Accepted Answers:

 Row i has the largest sum in $M^2 + M$