



**Date:** 01-09-2012

**Time:** 30 Min

**Course:** E2Sem1\_ECE/ E2Sem1\_ABC/E3Sem1\_ABC

**Max Marks:** 10

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**Answer Any TEN of the Following**

**$10 \times 1 = 10M$**

1. If  $A$  is an  $n \times p$  matrix, then which of the following set of vectors span a subspace of  $\mathbb{R}^n$ ?

- A. The column vectors of  $A$
- B. The row vectors of  $A$
- C. Both row and column vectors of  $A$
- D. Neither row nor column vectors of  $A$

2. A basis for the column space of  $\begin{bmatrix} 1 & 1 & -2 & 3 & 4 \\ 2 & 3 & 3 & -1 & 3 \\ 5 & 7 & 4 & 1 & 5 \end{bmatrix}$  is

- A.  $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} \right\}$
- B.  $\left\{ \begin{bmatrix} 1 \\ 2 \\ 5 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \\ 7 \end{bmatrix} \right\}$
- C.  $\left\{ \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix}, \begin{bmatrix} 4 \\ -5 \\ 5 \end{bmatrix} \right\}$
- D.  $\left\{ \begin{bmatrix} 1 \\ 2 \\ 5 \end{bmatrix}, \begin{bmatrix} 1 \\ 3 \\ 7 \end{bmatrix}, \begin{bmatrix} 4 \\ 3 \\ 5 \end{bmatrix} \right\}$

3. If  $\mathbf{A}$  is an  $m \times n$  matrix, then  $\text{rank}(\mathbf{A}) + \text{nullity}(\mathbf{A}) = \underline{\hspace{2cm}}$
4. The dimension of the null space of a  $3 \times 5$  matrix is greater than or equal to
- A. 1
  - B. 5
  - C. 2
  - D. 3
5. Which of the following statements is not true?
- A.  $\mathbf{A}$  and  $\mathbf{A}^T$  have the same null space
  - B.  $\mathbf{A}$  and  $\mathbf{A}^T$  have the same number of pivots
  - C. If  $\mathbf{A}^T = -\mathbf{A}$  then the row space of  $\mathbf{A}$  is same as the column space.
  - D. None of the above
6. If  $\mathbf{A}$  is a  $4 \times 6$  matrix and the number of parameters in the general solution of  $\mathbf{A}\mathbf{X} = \mathbf{0}$  is 3, then the rank of  $\mathbf{A}$  is
- A. 1
  - B. 2
  - C. 3
  - D. 4

7. The rank of the matrix  $\begin{bmatrix} -1 & 2 & 0 & 4 & 5 \\ 3 & -7 & 2 & 0 & 1 \\ 2 & -5 & 2 & 4 & 6 \\ 4 & -9 & 2 & -4 & 4 \end{bmatrix}$  is

- A. 2
- B. 3
- C. 4
- D. 5

8. A basis for the space spanned by the vectors  $\mathbf{u}_1 = (1, 2, -1, 3, 4)$ ,  $\mathbf{u}_2 = (2, 4, -2, 6, 8)$ ,  $\mathbf{u}_3 = (1, 3, 2, 2, 6)$ ,  $\mathbf{u}_4 = (1, 4, 5, 1, 8)$ ,  $\mathbf{u}_5 = (2, 7, 3, 3, 9)$  is

- A.  $\{\mathbf{u}_2, \mathbf{u}_3, \mathbf{u}_4, \mathbf{u}_5\}$
- B.  $\{\mathbf{u}_1, \mathbf{u}_2, \mathbf{u}_3, \mathbf{u}_4\}$
- C.  $\{\mathbf{u}_2, \mathbf{u}_4, \mathbf{u}_5\}$
- D.  $\{\mathbf{u}_1, \mathbf{u}_3, \mathbf{u}_5\}$

9. If  $\mathbf{A}$  is a  $4 \times 1$  matrix and  $\mathbf{B}$  is a  $1 \times 4$  matrix, then the rank of  $\mathbf{AB}$  is

- A. 1
- B. 2
- C. 3
- D. 4

10. If  $\mathbf{A}$  and  $\mathbf{B}$  are  $n \times n$  real matrices, then which of the following statements is true?

- A.  $\text{rank}(\mathbf{A} + \mathbf{B}) = \text{rank}(\mathbf{A}) + \text{rank}(\mathbf{B})$
- B.  $\text{rank}(\mathbf{A} + \mathbf{B}) = \max(\text{rank}(\mathbf{A}), \text{rank}(\mathbf{B}))$
- C.  $\text{rank}(\mathbf{A} + \mathbf{B}) = \min(\text{rank}(\mathbf{A}), \text{rank}(\mathbf{B}))$
- D.  $\text{rank}(\mathbf{A} + \mathbf{B}) \leq \text{rank}(\mathbf{A}) + \text{rank}(\mathbf{B})$

11. If  $\text{rank}(\mathbf{A}_{5 \times 5})$  is 3 and  $\text{rank}(\mathbf{B}_{5 \times 5})$  is 4, then  $\text{rank}(\mathbf{AB})$  is

- A. 2
- B. 3
- C. 4
- D. 2 or 3

12.  $\rho(\mathbf{AB} - \mathbf{I})$

A.  $\geq \rho(\mathbf{A} - \mathbf{I}) + \rho(\mathbf{B} - \mathbf{I})$

B.  $\leq \rho(\mathbf{A} - \mathbf{I}) + \rho(\mathbf{B} - \mathbf{I})$

C.  $\geq \min(\rho(\mathbf{A} - \mathbf{I}), \rho(\mathbf{B} - \mathbf{I}))$

D.  $= \rho(\mathbf{A} - \mathbf{I}) + \rho(\mathbf{B} - \mathbf{I})$

### KEY TO WEEKLY TEST-3

1. A

2. B

3.  $n$

4. C

5. A

6. C

7. B

8. D

9. A

10. D

11. D

12. B