2017 Fall EE203001 Linear Algebra - Quiz 3

Name: ID:

1. Let A = $\begin{bmatrix} 1 & 2 & 2 & 3 \\ 2 & 4 & 5 & 7 \\ 4 & 8 & 9 & 13 \end{bmatrix}$. Please find:

   (a) Reduced row echelon form of A

   (b) Reduced row echelon form of A can be expressed as $\begin{bmatrix} I & F \\ 0 & 0 \end{bmatrix}$, Please find the block matrix F

   (c) Rank of A

   (d) Special Solution for Ax = 0

sol:

1. :

   (a) A = $\begin{bmatrix} 1 & 2 & 2 & 3 \\ 2 & 4 & 5 & 7 \\ 4 & 8 & 9 & 13 \end{bmatrix}$, Because Row3 = Row1 + Row2

   So A = $\begin{bmatrix} 1 & 2 & 2 & 3 \\ 2 & 4 & 5 & 7 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ = $\begin{bmatrix} 1 & 2 & 2 & 3 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ = $\begin{bmatrix} 1 & 2 & 0 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ = A_R

   (b) A_R = $\begin{bmatrix} 1 & 0 & 2 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$, So F = $\begin{bmatrix} 2 & 1 \\ 0 & 1 \end{bmatrix}$

   (c) Pivot of A is 2, So Rank of A is 2

   (d) column2 = 2column1 + 0column3 => column2 - 2column1 - 0column3 = 0
       column4 = 1column1 + 1column3 => column4 - 1column1 - 1column3 = 0

   So,Special Solution is $\begin{bmatrix} -2 \\ 1 \\ 0 \\ 0 \end{bmatrix}$, $\begin{bmatrix} -1 \\ 0 \\ -1 \\ 1 \end{bmatrix}$