Analytical Methods in Engineering (EE300) Quiz 2 Group 2

1)Reduce the following matrix into echolen form by row operations $A=\begin{bmatrix}2 & 4 & 8\\ 1 & 6 & 0\\ 0.5 & 5 & 3\end{bmatrix}$,

$\begin{bmatrix}2 & 4 & 8\\ 1 & 6 & 0\\ 0.5 & 5 & 3\end{bmatrix}$ $-0.5R_1+R_2\to R_2$, $-\frac{0.5}{2}R_1+R_3\to R_3$ $\begin{bmatrix}2 & 4 & 8\\ 0 & 4 & -4\\ 0 & 4 & 1\end{bmatrix}$

$-R_2+R_3\to R_3$ $\begin{bmatrix}2 & 4 & 8\\ 0 & 4 & -4\\ 0 & 0 & 5\end{bmatrix}$

2)a)Reduce the following matrix into echolen form by row operations.

b)Calculate the rank of the matrix

$\begin{bmatrix}2 & 1 & 0 & 3\\ 4 & 2 & 0 & 0\\ 6 & 0 & 3 & 10\end{bmatrix}$ $-2R_1+R_2\to R_2$, $-3R_1+R_3\to R_3$ $\begin{bmatrix}2 & 1 & 0 & 3\\ 0 & 0 & 0 & -6\\ 0 & -2 & 3 & 4\end{bmatrix}$

$R_2\leftrightarrow R_3$ $\begin{bmatrix}2 & 1 & 0 & 3\\ 0 & -2 & 3 & 4\\ 0 & 0 & 0 & -6\end{bmatrix}$

3)Solve the following equations by Gaus elimination method

$\begin{bmatrix}1 & 2 & 3\\ 4 & 5 & 6\\ 7 & 8 & 8\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}4\\ 4\\ 1\end{bmatrix}$ $\left(\begin{array}{cccc}1 & 2 & 3 & 4\\ 4 & 5 & 6 & 4\\ 7 & 8 & 8 & 1\end{array}\right)$ $-4R_1+R_2\to R_2$, $-7R_1+R_3\to R_3$

$\left(\begin{array}{cccc}1 & 2 & 3 & 4\\ 0 & -3 & -6 & -12\\ 0 & -6 & -13 & -27\end{array}\right)$ $-2R_2+R_3\to R_3$

$\left(\begin{array}{cccc}1 & 2 & 3 & 4\\ 0 & -3 & -6 & -12\\ 0 & 0 & -1 & -3\end{array}\right)$ $-z=-3$, $z=3$, $-3y-6z=-12$, $-3y=6$, $y=-2$

4)Examine the following equation systems a,b,c are any numbers.

$\begin{bmatrix}2 & a & b\\ 0 & 4 & c\\ 0 & 0 & 7\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}4\\ 4\\ 1\end{bmatrix}$

$x+2y+3z=4$, $x=-1$

State true or false.

True a)This system has **always** unique solution

Fals b)This system may have multiple solution

Fals c)We cannot say anything unless we know the values of a,b,c

5)Examine the following equation systems a,b are any **nonzero** number. ($a\neq 0$, $b\neq 0$)

$\begin{bmatrix}4 & 0 & 0 & 0\\ 0 & 4 & 1 & 3\\ 0 & 8 & 2 & 6\end{bmatrix}\begin{bmatrix}x\\ y\\ z\\ w\end{bmatrix}=\begin{bmatrix}a\\ b\\ 0\end{bmatrix}$ $\left(\begin{array}{cccc}4 & 0 & 0 & 0 & a\\ 0 & 4 & 1 & 3 & b\\ 0 & 0 & 0 & 0 & -2b\end{array}\right)$ $-2R_2+R_3\to R_3$

Rank A = 2 Rank $\bar{A}$ = 3

State true or false.

T a)This system has no solution

F b)This system has multiple solution

F c)We cannot say anything unless we know the values of a,b

6)Find the rank of the following matrices

$A=\begin{bmatrix}2 & 0 & 0 & 0\\ 0 & 4 & 0 & 0\\ 0 & 0 & 7 & 0\end{bmatrix}$ $B=\begin{bmatrix}1 & 2 & 4\\ 1 & 2 & 4\\ 1 & 2 & 4\end{bmatrix}$

$C=\begin{bmatrix}1 & 0 & 0\\ 0 & 0 & 0\\ 0 & 0 & 1\end{bmatrix}$, $D=\begin{bmatrix}5 & 5 & 5\\ 25 & 25 & 55\\ 0 & 0 & 2.5\end{bmatrix}$,

Rank A=3 Rank B=1 Rank C=2 Rank D=2

7) $x=\begin{bmatrix}2\\ 0\\ 0\end{bmatrix}$, $y=\begin{bmatrix}0\\ 2\\ 4\end{bmatrix}$, $z=\begin{bmatrix}1\\ 1\\ 2\end{bmatrix}$ x,y and z are linearly dependent

$z=2x+0.5y$

8)Examine the following equations and **complete** the sentence

$\begin{bmatrix}2 & 3 & 4 & 5\\ 0 & 5 & 6 & 7\\ 0 & 0 & 2 & 3\end{bmatrix}\begin{bmatrix}x\\ y\\ z\\ w\end{bmatrix}=\begin{bmatrix}0\\ 0\\ 0\end{bmatrix}$

This system has multiple solution and 1 variables are freely selected.

9)Examine the following equation system

$2x+3y=10$

$x+z=3$

State True or False

F a)x=2, y=2 is a solution

T b)x=5, y=0 is a solution

F c)x=2, y=2, z=2 is a solution

T d)x=5, y=0, z=-2 is a solution

10)The determinant $\begin{vmatrix}2 & 0 & 0\\ 3 & 2 & 0\\ 4 & 5 & 6\end{vmatrix}=2\begin{vmatrix}2 & 0\\ 5 & 6\end{vmatrix}=2\times 2\times 6=24$