Question 1

1.1 we have ,

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

which is an 2*2 identity matrix and already in Echolan form. we can clearly see that the 2 columns of the matrix are Linearly independent. we know that independent columns in a matrix forms basis for C(A)
so,the basis for C(A) =

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

and

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

so,Column space of A = R$^2 i.e C(A) = 2$

1.2 we have,

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

By Converting the matrix B into Echolan form i.e R2=R2-2R1,

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

We know that, Span(all Columns)= Span (pivot Columns) = Basis for C(B). We can see in echolan form of Matrix B the only pivot element is 1. So,the basis for C(B) =

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

Therefore,Column space of B = R i.e C(B) = 1

On the otherway,we can see the columns of matrices are linearly dependent as C2=2*C1. There is only one indepedent column in matrix B and we know that independent columns in a matrix forms basis for C(B)
Therefore,Column space of B = R i.e C(B) = 1.

1.3 we have ,

$$D = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 4 \end{bmatrix}$$

This matrix is already in Echolan Form and the pivot elements are 1 and 4. We know that, Span(all Columns)= Span (pivot Columns) = Basis for C(D). so,the basis for C(D) =

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

and

$$\begin{bmatrix} 3 \\ 4 \end{bmatrix}$$

Therefore,Column space of D = $\mathrm{R}^2 i.eC(D) = 2$.

On the other way, we can see the columns of matrices are linearly dependent as C2=2*C1.
There is only 2 indepedent column i.e C1,C3 in matrix D

we know that independent columns in a matrix forms basis for C(D)
Therefore,Column space of D = $\mathrm{R}^2 i.eC(D) = 2$.