Definition:

~~Non-eg.~~

① Non-degenerate basic solutions: If all components of the basic variable are nonzero quantities then the basic solution is called ~~non-degenerated~~ non-degenerate basic solution.

② Degenerate basic solution:-

If some components of solution set of basic variable vanishes then it is called degenerate basic solution.

③ basic feasible solution:

The solution which is both basic and feasible is called basic feasible solution.

④ Non degenerate basic feasible solution:

If all the components of the basic variable are positive quantities then it is called non-degenerate basic feasible solution

⑤ Degenerate basic feasible solution:

If some components of the basic.

feasible solution is zero then it is called degenerate basic feasible solution.

Ex: Prove that $x_1 = 2, x_2 = 0$ and $x_3 = 1$ is a basic solution to the set of equations

$$2x_1 + x_2 - x_3 = 3$$
$$x_1 + 2x_2 + 3x_3 = 5$$

Here $A = \begin{bmatrix} 2 & 1 & -1 \\ 1 & 2 & 3 \end{bmatrix}$, $b = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$

Now rank of $A = 2$. Hence the set of equations are linearly independent. We can see that $(2,0,1)$ satisfies the above equation. Hence it is a solution.

As the vectors $a_1 = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ and $a_3 = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ associated with x_1, x_3 are linearly independent so it is a basic solution.

Ex: Show that $x_1 = 2, x_2 = -1, x_3 = 0$ is a solution ~~set~~ but not a basic solution to the set of equations.

$$3x_1 - 2x_2 + x_3 = 8.$$
$$9x_1 - 6x_2 + 4x_3 = 24.$$

Sol: Here $A = \begin{bmatrix} 3 & -2 & 1 \\ 9 & -6 & 4 \end{bmatrix}$ So rank$(A) = 2$

Hence the equations are linearly independent

Here $b = \begin{bmatrix} 8 \\ 24 \end{bmatrix}$. Now $(2,-1,0)$ is a solution. nonzero basic variables

but the vectors corresponding to $x_1 = 2$ i.e. $\begin{bmatrix} 3 \\ 9 \end{bmatrix}$ and $x_2 = -1$ i.e. $a_2 = \begin{pmatrix} -2 \\ -6 \end{pmatrix}$ is not linearly independent. So it is not a basic solution

Scanned with CamScanner