Note: Row operation :- These are 3 kind of elementry Row operation

(1) Switching of Rows :- A row can be Interchange. with another row $R_i \leftrightarrow R_j$

Date : / /
Page No.:

(2) Row multiplication:- A non zero Number can be Multipled ~~ex~~ to every eliminate in a row.

$aR_j \longrightarrow R_i$ where $a \neq 0$

(2) Row addition (subtraction):-
we may replaced a row by the sum of element of row and a multiple of corresponding element of another row.

$R_i + aR_j \longrightarrow R_i$ when $\cancel{a} \neq 0$. $i \neq j$

RRFP $\rightarrow \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Date: / /
Page No.:

Gauss Elimination Method:—

Also called ~~forward~~ elimination method.

- used to solve the linear / system of linear equation by using $Ax=b$ - augmented matrix (consisting of m equation in n unknown)

$$[A \mid b] = \left[\begin{array}{cccc|c} a_{11} & a_{12} & \cdots & a_{1n} & b_1 \\ a_{21} & a_{22} & \cdots & a_{2n} & b_2 \\ \vdots & \vdots & & \vdots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} & b_m \end{array}\right]$$

to an upper triangular matrix form

$$\left[\begin{array}{cccc|c} c_{11} & c_{12} & \cdots & c_{1n} & d_1 \\ 0 & c_{22} & \cdots & c_{2n} & d_2 \\ \vdots & \vdots & & \vdots & \vdots \\ 0 & 0 & \cdots & c_{nm} & d_m \end{array}\right]$$

Working Rule:—

Step-I Consider the System of linear equation.

$$a_1x + b_1y + c_1z = d_1$$
$$a_2x + b_2y + c_2z = d_2$$
$$a_3y + b_3y + c_3z \; d_3$$

i.e $Ax=B$

$$\begin{bmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} d_1 \\ d_2 \\ d_3 \end{bmatrix}$$

step-II Find augmented matrix for given system.

$$C = [A : B]$$

Date : / /
Page No.:

Step-III Transform augmented matrix into upper triangular form /. row echelon form using some Row operation.

step-IV find equations corresponding to upper triangular matrix /.

step-V using back substitution find (x, y, z) sol^n of given system of eq^n.

Q. solve the system of linear equation by Gauss elimination Method.

equations

$$2x - y + 3z = 9$$
$$x + y + z = 6$$
$$x - y + z = 2$$

Sol^n given system of equation can be written as $AX = B$

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \\ 2 & -1 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 2 \\ 9 \end{bmatrix}$$

step-II Now find augmented matrix given system.

$$C = [A : B]$$

$$C = \left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 1 & -1 & 1 & 2 \\ 2 & -1 & 3 & 9 \end{array}\right]$$

step-III transform augmented matrix into upper triangular matrix by

Date : / /
Page No.:

$R_2 \rightarrow R_2 - R_1$ and $R_3 \rightarrow R_3 - 2R_1$

$$C = \left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & -2 & 0 & -4 \\ 0 & -3 & 1 & -3 \end{array}\right]$$

$$\begin{array}{cccc} 0 & -6 & 2 & 8 \\ 0 & -6 & 0 & 12 \\ + & - & & - \\ \hline 0 & 2 & & 4 \end{array}$$

By $R_3 \rightarrow 2R_3 - 3R_2$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & -2 & 0 & -4 \\ 0 & 0 & 2 & 6 \end{array}\right]$$

$x + y + z = 6$

$-2y = -4$

$2z = 6$

$z = 6/2 = 3$

$y = 2$

$x + 2 + 3 = 6 - 5$

$x = +1$

$x = 1$

$\boxed{\therefore x = 1, \; y = 2 \quad z = 3}$