CHAPTER -2

EQUATIONS AND MATRICES

UNIT-1

EQUATIONS

EQUATIONS:

* Equation is defined to be a mathematical statement of equality.

CONDITIDIONAL EQUATION:

* If the equality is true for certain value of the variable involved, the equation is called a conditional equation.

Eg: $\frac{x+2}{3} + \frac{x+3}{2} = 3$ holds true only for $x = 1$.

IDENTITY:

* If the equality is true for all values of the variable involved, the equation is called an identity.

SOLUTION OR ROOT OF THE EQUATION:

* Determination of value of the variable which satisfies an equation is called solution of the equation or root of the equation.

* While finding solution / roots of the equation, it is advisable to equate the equation to 0.

LINEAR EQUATION:

* Highest power of the equation is 1.
* Eg: $8x+17(x-3) = 4(4x-9)+12$

QUADRATIC EQUATION:

* Highest power of the equation is 2
* Eg: $3x^2+5x+6=0$.

CUBIC EQUATION:

* Highest power of the equation is 3.
* Eg: $x^3+3x^2+x-7=1$

SIMULTANEOUS EQUATIONS:

* Two or more equations involving two or more variables.
* Eg: $x+2y=1$; $2x+3y=2$.

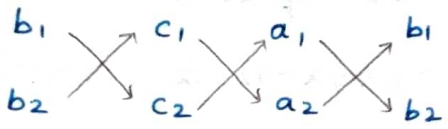
SIMPLE EQUATION:

* One unknown x is in the form $ax+b=0$.
* Eg: $\frac{4x}{3} - 1 = \frac{14x}{15} + \frac{19}{15}$

METHODS OF SOLVING SIMULTANEOUS LINEAR EQUATIONS :

i) Elimination method.

ii) Cross multiplication method.



$$\Rightarrow \frac{x}{b_1c_2 - b_2c_1} = \frac{y}{c_1a_2 - c_2a_1} = \frac{1}{a_1b_2 - a_2b_1}$$

$$x = \frac{b_1c_2 - b_2c_1}{a_1b_2 - a_2b_1}$$

$$y = \frac{c_1a_2 - c_2a_1}{a_1b_2 - a_2b_1}$$

QUADRATIC EQUATION :

* Qudratic equation is of the form $ax^2 + bx + c = 0$ where $a \neq 0$.
* If $b = 0$, then it is called pure quadratic equation.
* If $b \neq 0$, then it is called affected quadractic equation.

METHODS OF SOLVING QUADRATIC EQUATION:

* Factorisation method.
* Formula method. $\left[x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}\right]$

CONSTRUCTION OF A QUADRATIC EQUATION:

$$ax^2 + bx + c = 0 .$$

$x^2 - (\text{Sum of roots})x + \text{products of roots} = 0 .$

Where, sum of roots $= \frac{-b}{a}$

Products of roots $= \frac{c}{a}$

NATURE OF ROOTS:

* If $b^2 - 4ac = 0$, then roots are real & equal.
* If $b^2 - 4ac > 0$, then roots are real & unequal.
* If $b^2 - 4ac < 0$, then roots are imaginary.
* If $b^2 - 4ac > 0$ and is a perfect square, then roots are real, unequal & rational.
* If $b^2 - 4ac > 0$ and is not a perfect square, then roots are real, unequal & irrational.

NOTES:

i) IMAGINARY OR COMPLEX NUMBERS:

* The square root of negative numbers are called imaginery or complex numbers.
* Eg: $\sqrt{-2}$, $\sqrt{-64}$

ii) REAL NUMBERS:

* All numbers except imaginary numbers are called real numbers.

RATIONAL NUMBERS:

* All positive & negative numbers without squareroot is called rational numbers.

* Eg: $25, \sqrt{25}, \sqrt{100}, 100$.

IRRATIONAL NUMBERS:

* The square root of a possible real number whose value cannot be determined exactly but can be determined approximately is called irrational number.

* Eg: $\sqrt{5}, \sqrt{2}$

[Rational numbers & irrational numbers are subset of real numbers]

POINTS TO REMEMBER:

* b^2-4ac is called the discriminant as it discriminates the roots.

* Irrational roots occur in conjucate parts.
  Eg: $2-\sqrt{3}$; $2+\sqrt{3}$

* If $a+b+c=0$ in a quadratic equation $ax^2+bx+c=0$, then the roots are real & rational and one root is 1 and the other root is c/a.

CUBIC EQUATION:

$$ax^3 + bx^2 + cx + d = 0.$$

Sum of roots $= -b/a$

Product of roots $= -d/c$

SOLUTION OF CUBIC EQUATION:

* On trial basis putting, if some value of x satisfies the equation then we get a factor.
* This is a trial & error method.
* With this factor, factorise the cubic equation and get other two values of x.