I B.Sc [MATHEMATICS]

16.01.05

ANALYTICAL GEOMETRY 3D

16SCCMM4

BASIC FORMULAE

UNIT-I

1) Distance between two points, $PQ = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2+(z_2-z_1)^2}$

2) The co-ordinates of the points,

$$x = \frac{mx_2+nx_1}{m+n}, \quad y = \frac{my_2+ny_1}{m+n}, \quad z = \frac{mz_2+nz_1}{m+n}$$

3) $l^2+m^2+n^2=1$

4) Direction cosines :-

$$l = \frac{a}{\sqrt{a^2+b^2+c^2}}, \quad m = \frac{b}{\sqrt{a^2+b^2+c^2}}, \quad n = \frac{c}{\sqrt{a^2+b^2+c^2}}$$

5) The angle between two lines whose direction ratios are (a_1, b_1, c_1) and (a_2, b_2, c_2) is given by,

$$\cos\theta = \frac{a_1a_2+b_1b_2+c_1c_2}{\sqrt{a_1^2+b_1^2+c_1^2} \times \sqrt{a_2^2+b_2^2+c_2^2}}$$

) Equation of the plane,

$$\begin{vmatrix} x-x_1 & y-y_1 & z-z_1 \\ x_2-x_1 & y_2-y_1 & z_2-z_1 \\ x_3-x_1 & y_3-y_1 & z_3-z_1 \end{vmatrix} = 0$$

7) Length of the ⊥r from Pt C

$$= \frac{ax_1 + by_1 + cz_1}{\sqrt{a^2+b^2+c^2}}$$

— x —

UNIT- II

1) Equation of the straight line

$$\frac{x-x_1}{l} = \frac{y-y_1}{m} = \frac{z-z_1}{n} = r$$

2) Angle between a line and a plane

$$\sin\theta = \frac{al+bm+cn}{\sqrt{a^2+b^2+c^2} \times \sqrt{l^2+m^2+n^2}}$$

3) Coplanar

$$\begin{vmatrix} x_2-x_1 & y_2-y_1 & z_2-z_1 \\ l_1 & m_1 & n_1 \\ l_2 & m_2 & n_2 \end{vmatrix} = 0$$

Unit-III

The equation of the sphere whose centre is (a,b,c) and radius is r, is

$$(x-a)^2+(y-b)^2+(z-c)^2=r^2$$

2) Centre

$$=\left(-\frac{1}{2}\text{ co-eff of } x,\ -\frac{1}{2}\text{ co-eff of } y,\ -\frac{1}{2}\text{ co-eff of } z\right)$$

3) radius $= \sqrt{u^2+v^2+w^2-d}$

4) Grammer's rule,

$$u=\frac{\Delta_1}{\Delta},\quad v=\frac{\Delta_2}{\Delta},\quad w=\frac{\Delta_3}{\Delta}$$

5) Conditions of orthogonally two spheres

$$2uu_1+2vv_1+2ww_1=d_1+d_2$$