Date 24-04-20

Lecture Notes - 27

BCA I year (II Sem)

Subject - Mathematics.

Topic - Sphere.

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Exp-14 A Circle of Centre (2, 3, 0) with radius 1 is drawn in the plane $Z=0$. Find the equation of the Sphere which passes through the ~~Circle~~ Circle at the point (1,1,1)

Solution The equation of Circle of Centre (2, 3, 0) with radius 1 in the plane $Z=0$ is given by

$$(x-2)^2+(y-3)^2+(z-0)^2=1 \quad , Z=0$$

So $S=(x-2)^2+(y-3)^2+z^2-1=0$ is Sphere.

and $P=z=0$ is plane

Then the equation of any Sphere through Circle

$$(x-2)^2+(y-3)^2+z^2-1+\lambda z=0$$

If it passes through (1, 1, 1) then

$$(1-2)^2+(1-3)^2+(1)^2-1+\lambda(1)=0$$

$$\Rightarrow 1+4+1-1+\lambda=0$$

$$\Rightarrow \boxed{\lambda=-5}$$

Hence the required equation of Sphere is

$$(x-2)^2+(y-3)^2+z^2-1-5z=0$$

$$\Rightarrow x^2+4-4x+y^2+9-6y+z^2-1-5z=0$$

$$\Rightarrow x^2+y^2+z^2-4x-6y-5z+12=0$$

Ans

Imp

Exp-15 Find the radius and Centre of the Circle of intersection of the Sphere $x^2+y^2+z^2-2y-4z-11=0$ and the plane $x+2y+2z-15=0$

Solution The equation of given Circle and Plane are

$$x^2+y^2+z^2-2y-4z-11=0$$

$$x+2y+2z-15=0$$

The Centre of Sphere is $(0,1,2)$ and radius $r=\sqrt{(0)^2+(1)^2+(2)^2-(-11)}$

$$=\sqrt{0+1+4+11}=\sqrt{16}$$

$$=4.$$

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Let p is the perpendicular from the Centre of Sphere to the plane

Then p = Length of the perpendicular from the point C(0,1,2) to the plane.

$$\Rightarrow p = \frac{1(0)+2(1)+2(2)-15}{\sqrt{(0)^2+(2)^2+(2)^2}} = \frac{9}{3} = 3.$$

Then the radius of the Circle in which the plane Cuts the Sphere

$$= \sqrt{r^2-p^2} = \sqrt{(4)^2-(3)^2}$$

$$= \sqrt{16-9} = \sqrt{7}$$

So The equation of Straight line through (0,1,2) with direction ratios (1,2,2) is

$$\frac{x-0}{1} = \frac{y-1}{2} = \frac{z-2}{2} = k$$

Then $(k, 2k+1, 2k+2)$ are Coordinates

But point lies on plane So

$$k+2(2k+1)+2(2k+2)-15 = 0$$

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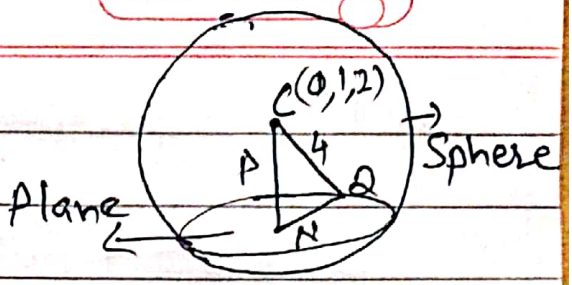
$\Rightarrow 9k - 9 = 0$

$\Rightarrow k = 1$



Then Co-ordinates are $(1, 3, 4)$

Hence the Centre of Circle in which the plane Cuts the Sphere, is the Point $(1,3,4)$ and its radius is $\sqrt{7}$.

And

EXP-16, P-370 Do itself

EXP-17, P-371