

## Three Dimensional Geometry - Class XII

### Past Year JEE Questions

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#### Questions

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##### Question: 01

A plane passing through the points  $(0, -1, 0)$  and  $(0, 0, 1)$  and making an angle  $\frac{\pi}{4}$  with the plane  $y - z + 5 = 0$ , also passes through the point

- A.  $(\sqrt{2}, 1, 4)$
- B.  $(-\sqrt{2}, 1, 4)$
- C.  $(-\sqrt{2}, -1, -4)$
- D.  $(\sqrt{2}, -1, 4)$

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#### Solutions

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##### Solution: 01

##### Explanation

Let  $ax + by + cz = 1$  be the equation of the plane

it passed through point  $(0, -1, 0)$ .

$$\therefore -b = 1$$

$$\Rightarrow b = -1$$

Also it passes through point  $(0, 0, 1)$

$$\therefore c = 1$$

So the plane is  $ax - y + z = 1$ .

This plane an angle  $\frac{\pi}{4}$  with the plane  $y - z + 5 = 0$ .

Normal to the plane  $ax - y + z = 1$  is

$$\vec{a} = a\hat{i} - \hat{j} + \hat{k}$$

Normal to the plane  $y - z + 5 = 0$  is

$$\vec{b} = \hat{j} - \hat{k}$$

$$\cos \theta = \left| \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|} \right|$$

$$\Rightarrow \frac{1}{\sqrt{2}} = \left| \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|} \right|$$

$$\Rightarrow \frac{|0 - 1 - 1|}{\sqrt{a^2 + 1 + \sqrt{1^2 + 1^2}}} = \frac{1}{\sqrt{2}}$$

$$\Rightarrow a^2 + 2 = 4$$

$$\Rightarrow a = \pm \sqrt{2}$$

$\therefore$  Equation of plane

$$\pm \sqrt{2}x - y + z = 1$$

Now by checking each options you can see

equation -  $\sqrt{2}x - y + z = 1$  satisfy by the point  $(\sqrt{2}, 1, 4)$ .