



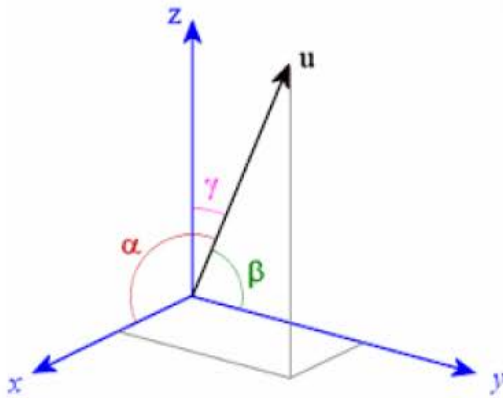
Rao IIT Academy

Symbol of Excellence and Perfection

JEE | MEDICAL-UG | BOARDS | KVPY | NTSE | OLYMPIADS

Lecture: 01 (18/03/2020) 9.00 AM TO 10.00 AM

CONCEPT:1



- α, β, γ are direction angle of a line in three dimensional space $0^\circ \leq \alpha, \beta, \gamma < 180^\circ$.
- If α, β, γ are direction angle of a line in three dimensional space then $\cos^2(\alpha) + \cos^2(\beta) + \cos^2(\gamma) = 1$ or $l^2 + m^2 + n^2 = 1$ where $l = \cos\alpha, m = \cos\beta$ and $n = \cos\gamma$ are d. cs of line.

CONCEPT:2

DIRECTION RATIOS (DRS)

- If l, m, n are drs of line and a, b, c are numbers such that $\frac{l}{a} = \frac{m}{b} = \frac{n}{c}$ then a, b, c are known as drs of line.
- A line may have infinite drs and are praportional. Let a_1, b_1, c_1 and a_2, b_2, c_2 are drs of same line then $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$. (Helpful in solving collinearity problems).
- If l, m, n are dcs of line then unit vector along the line $\hat{e} = l\hat{i} + m\hat{j} + n\hat{k}$, and If \overrightarrow{AB} is vector whose magnitude is k then $\overrightarrow{AB} = k\hat{e}$
- If $\overrightarrow{AB} = a\hat{i} + mb + c\hat{k}$ then a, b, c are drs of line.
- If $A(x_1, y_1, z_1)$ and $B(x_2, y_2, z_2)$ then drs of line $a = x_2 - x_1, b = y_2 - y_1$ and $c = z_2 - z_1$ Or $a = x_1 - x_2, b = y_1 - y_2, c = z_1 - z_2$

ASSIGNMENT: 01

1. If $\frac{\alpha}{2}, \frac{\beta}{2}, \frac{\gamma}{2}$ are direction angle of a line in three dimensional space then find
- i) $\cos(\alpha) + \cos(\beta) + \cos(\gamma) + 1 = ?$
- (A) 2 (B) -1 (C) 0 (D) 3
- ii) $\sin^2\left(\frac{\alpha}{2}\right) + \sin^2\left(\frac{\beta}{2}\right) + \sin^2\left(\frac{\gamma}{2}\right) =$
- (A) 2 (B) -1 (C) 0 (D) 3
- iii) $\frac{1 - \tan^2\left(\frac{\alpha}{2}\right)}{1 + \tan^2\left(\frac{\alpha}{2}\right)} + \frac{1 - \tan^2\left(\frac{\beta}{2}\right)}{1 + \tan^2\left(\frac{\beta}{2}\right)} + \frac{1 - \tan^2\left(\frac{\gamma}{2}\right)}{1 + \tan^2\left(\frac{\gamma}{2}\right)} =$
- (A) 2 (B) -1 (C) 0 (D) 3
2. A line makes an angle of $\pi/4$ with each of the x and y-axes then find the angle of the line with z axis.
- (A) 90^0 (B) 60^0 (C) 30^0 (D) 45^0
3. A line makes an angle of 45^0 with x axis and equal angle with positive direction of y and z axes. Find sum of the three angles made by the line with positive direction of axes.
- (A) 90^0 (B) 160^0 (C) 165^0 (D) 185^0
4. Find vector whose magnitude is 3 units and equally inclined to coordinate axes.
- (A) $\pm \sqrt{3}(\hat{i} + \hat{j} + \hat{k})$ (B) $\pm 3(\hat{i} + \hat{j} + \hat{k})$ (C) $\pm \frac{1}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k})$ (D) $\pm \frac{1}{\sqrt{2}}(\hat{i} + \hat{j} + \hat{k})$

5. Find value of a for which the points $(8, -7, a)$, $(5, 2, 4)$ and $(6, -1, 2)$ are always Collinear.
- (A) 2 (B) -1 (C) -2 (D) 5
6. The direction ratios of \overrightarrow{AB} are $-2, 2, 1$. If $A = (4, 1, 5)$ and $l(AB) = 6$ units, find the coordinates of B .
- (A) $(0, 5, 7)$ (B) $(8, -3, 3)$ (C) *both A and B* (D) *None*
7. If directed line segment makes an angle of 45° and 60° with x and z axes then find its angle with y axis. (Multiple Choice)
- (A) 90° (B) 60° (C) 120° (D) 135°
8. Which of the followings cannot be direction cosines of a line?
- (A) $\frac{1}{3}, \frac{2}{3}, -\frac{2}{3}$ (B) $\frac{1}{\sqrt{3}}, -\frac{2}{\sqrt{3}}, \frac{2}{\sqrt{3}}$ (C) $\pm\frac{1}{3}, \pm\frac{1}{3}, \pm\frac{1}{3}$ (D) $\frac{9}{11}, \frac{4}{11}, -\frac{2\sqrt{6}}{11}$
9. Line in space exists with direction angles.
- (A) $(30^\circ, 45^\circ, 60^\circ)$ (B) $(45^\circ, 45^\circ, 90^\circ)$ (C) $(30^\circ, 135^\circ, 60^\circ)$ (D) *None*
10. If $3\alpha, 3\beta, 3\gamma$ are direction angle of a line in three dimensional space then find $\cos(6\alpha) + \cos(6\beta) + \cos(6\gamma) + 1 = ?$
- (A) 2 (B) -1 (C) 0 (D) 3

Answer will be discussed in next lecture.

WASH YOUR HAND WITH SOAP AND AVOID JUNK FOOD TO BE FIT AND AWAY FROM CORONA AND ATTEND ONLINE LECTURES REGULARLY