Past Year JEE Questions

Questions

Quetion: 01

In a ΔPQR, If $3 \sin P + 4 \cos Q = 6$ and $4 \sin Q + 3 \cos P = 1$, then the angle R is equal to :

A. $\frac{5\pi}{6}$

B. $\frac{\pi}{6}$

C. $\frac{\pi}{4}$

D. $\frac{3\pi}{4}$

Solutions

Solution: 01

Explanation

Given $3 \sin P + 4 \cos Q = 6$ $\ldots (i)$

$4 \sin Q + 3 \cos P = 1$ $\ldots (ii)$

Squaring and adding (i) & (ii) we get

$9 \sin^2 P + 16\cos^2 Q + 24 \sin P \cos Q$

$\qquad +16 \sin^2 Q + 9\cos^2 P + 24 \sin Q \cos P$

$\qquad = 36 + 1 = 37$

$\Rightarrow 9 \left(\sin^2 p + \cos^2 P \right) + 16 \left(\sin^2 Q + \cos^2 q \right)$

$\qquad +24 \left(\sin P \cos Q + \cos P \sin Q \right) = 37$

$\Rightarrow 9 + 16 + 24 \sin(P + Q) = 37$

[As $\sin^2 \theta + \cos^2 \theta = 1$ and

$\sin A \cos B + \cos A \sin B = \sin(A + B)$]

$\Rightarrow \sin(P + Q) = \frac{1}{2}$

$\Rightarrow P + Q = \frac{\pi}{6}$ or $\frac{5\pi}{6}$

$\Rightarrow R = \frac{5\pi}{6}$ or $\frac{\pi}{6}$

(as $P + Q + R = \pi$)

If $R = \frac{5\pi}{6}$ then $0 < P, Q < \frac{\pi}{6}$

$\Rightarrow \cos Q < 1$ and $\sin P < \frac{1}{2}$

$\Rightarrow 3 \sin P + 4 \cos Q < \frac{11}{2}$ which is not true.

So $R = \frac{\pi}{6}$