14. Find the equation of ellipse whose eccentricity is $\dfrac{2}{3}$, latusrectum is 5 and the center is $(0,0)$.

Ans:

Given

$$e = \frac{2}{3}$$

Latusrectum $= 5.$

Center of the circle i.e., $(h,k) = (0,0)$

$e = \dfrac{2}{3}$ and latusrectum $= 5$ (given)

i.e., $\dfrac{2b^2}{a} = 5$

$\Rightarrow b^2 = \dfrac{5a}{2}$

$\because b^2 = a^2\left(1 - e^2\right)$

$\Rightarrow \dfrac{5a}{2} = a^2\left(1 - \dfrac{4}{9}\right)$

$\Rightarrow \dfrac{5}{2} = \dfrac{5a}{9}$

$\Rightarrow a = \dfrac{9}{2}$

$$\Rightarrow a^2 = \frac{81}{4}$$

$$b^2 = \frac{5 \times 9}{2 \times 2} = \frac{45}{4}$$

So, the required equation of ellipse is $\dfrac{4x^2}{81} + \dfrac{4y^2}{45} = 1$