Question
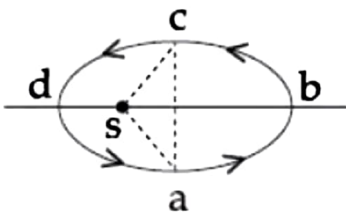
Figure shows elliptical path abcd of a planet around the sun S such that the area of triangle csa is $\frac{1}{4}$ the area of the ellipse. (See figure) With db as the major axis, and ca as the minor axis. If t_1 is the time taken for planet to go over path abc and t_2 for path taken over cda then

A $t_1 = 4t_2$

B $t_1 = 2t_2$

C $t_1 = t_2$

D $t_1 = 3t_2$

Solution

Correct option is
D)

Since area of triangle csa is $\frac{1}{4}$ of total area of ellipse, therefore:

Area of cdas = $\frac{1}{3}$ Area of abcs

Now that from Kepler's second law areal velocities of the planets are constant which essentially means planets cover equal area in equal time interval.
Hence,
Time taken in covering path abc and path cda will be in proportion to their respective enclosed areas.

$\implies t_1 = 3t_2$