5.37 A racing car travels on a track (without banking) ABCDEFA (Fig. 5.10). ABC is a circular arc of radius $2R$. CD and FA are straight paths of length R and DEF is a circular arc of radius $R = 100$ m. The co-effecient of friction on the road is $\mu = 0.1$. The maximum speed of the car is 50 m s^{-1}. Find the minimum time for completing one round.
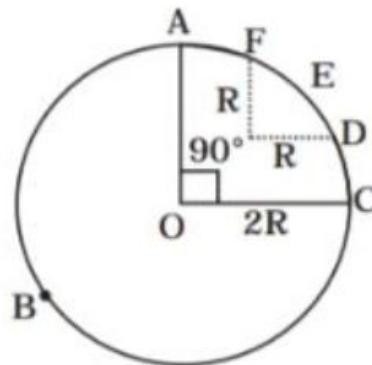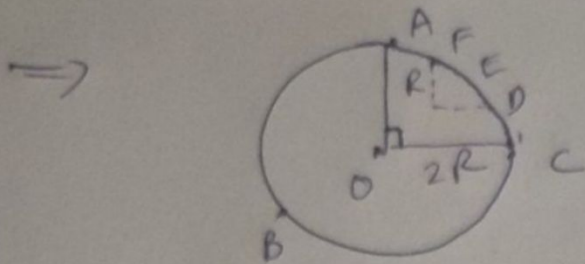

Fig. 5.10

$\Rightarrow$

Time taken from A to B to C $\Rightarrow$

S_1 = length of path = $\dfrac{3}{4} \, 2\pi (2R) = 300\pi$ m

V_1 = Max. speed.

$= \sqrt{\pi r g} = 14.14$ m/s

$T_1 = \dfrac{S_1}{V_1} = 66.62$ s

Time taken from C to D & F to A

V_2 is the max. speed = 50 m/s

$T_2 = S_2/V_2 = 4s$

Time taken from D to E to F

$S_3 = \dfrac{1}{4} \times 2\pi R = 50\pi$

$V_3 = \sqrt{llrg} = 10$ m/s

$T_3 = \dfrac{S_3}{V_3} = 15.7s$

Total time $\quad T_1 + T_2 + T_3 = 86.32$ s