The relationship between mass flow rate $\dot{m}$, and flow velocity V , is:

$$\dot{m} = \rho \cdot A \cdot V$$

or in terms of the specific volume v (the inverse of density):

$$\dot{m} = \frac{A \cdot V}{v} \qquad (1)$$

We now use the ideal gas equation of state to find the specific volume of air at the conditions given for the diffuser inlet:

$$v = \frac{R\,T}{p} = \frac{\left(0.287\,\frac{\text{kPa}\cdot\text{m}^3}{\text{kg}\cdot\text{K}}\right)(283\,\text{K})}{80\,\text{kPa}} = 1.015\,\frac{\text{m}^3}{\text{kg}}$$

Now, insert this in equation (1):

$$\dot{m} = \frac{(0.4\,\text{m}^2)(200\,\text{m/s})}{1.015\,\text{m}^3/\text{kg}} = 78.8\,\text{kg/s}$$

The problem statement requires the mass flow rate in kg/min, therefore:

$$\dot{m} = 78.8\,\frac{\text{kg}}{\text{s}} \cdot \left|\frac{60\,\text{s}}{1\,\text{min}}\right| = 4728\,\text{kg/min}$$

The correct answer is (D)