

- Q 02. A wind-powered generator converts wind energy into electrical energy. Assume that the generator converts a fixed fraction of the wind energy intercepted by its blades into electrical energy. For wind speed v , the electrical power output will be proportional to (2000S)
- (a) v (b) v^2 (c) v^3 (d) v^4

$$\begin{aligned} \text{(c) } F &= v \left(\frac{dm}{dt} \right) = v \frac{d}{dt} (\rho \times \text{Volume}) = v \rho \frac{d}{dt} (\text{Volume}) \\ &= v \rho \times (Av) = A\rho v^2 \\ \text{Power} &= \text{Force} \times \text{Velocity} = A\rho v^2 \times v = A\rho v^3 \\ &\Rightarrow P \propto v^3 \end{aligned}$$
