Q 01. A particle of mass m is moving in a circular path of constant radius r such that its centripetal acceleration a_c is varying with time t as $a_c = k^2rt^2$ where k is a constant. The power delivered to the particles by the force acting on it is:

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(a) $2\pi\ mk^2r^2\ t$ (b) mk^2r^2t

(c) $\frac{(mk^4r^2t^5)}{3}$ (d) zero

(b) The centripetal acceleration

$$a_c = k^2\ r\ t^2 \Rightarrow \frac{v^2}{r} = k^2rt^2$$

$$\Rightarrow \frac{1}{2}mv^2 = \frac{m}{2}k^2r^2t^2 \quad \ldots (i)$$

$$\Rightarrow \text{K.E.} = \frac{m}{2}k^2r^2t^2 \Rightarrow \frac{d}{dt}(\text{K.E.}) = mk^2r^2t$$

$$\Rightarrow \text{Power} = mk^2r^2t$$