The displacement of a particle executing periodic motion is given by $y = 4\cos^2\left(\frac{t}{2}\right)\sin(1000t)$.

Which of the following is NOT an independent constituent simple harmonic motion?

(A) sin 999t (B) sin 1000t (C) sin 1001t (D) 2 sin 1000t

Solution

We have, $y = 4\cos^2\left(\frac{t}{2}\right)\sin(1000t)$

Or $y = 2(1+\cos t)\sin(1000t)$

Or $y = 2\sin(1000t) + 2\sin(1000t)\cos t$

Or $y = 2\sin(1000t) + \sin(1001t) + \sin(999t)$

The three independent constituent simple harmonic motions are evident from above. So, the answer is option (B).