Answer on Question #40678, Physics, Optics

A plane mirror is moving with velocity 4Ã+5j+8k. A point object in front of the mirror moves with a velocity 3Ã+4j+5k. Here k is along the normal to the plane mirror and facing towards the object. The velocity of the image is 1. -3Ã+4j+5k 2. 7Ã+9j+11k 3. 3Ã+4j+11k 4. -3Ã-4j+11k

Solution

$\overrightarrow{V_{MG}}$ - a velocity of plane mirror, $\overrightarrow{V_{OG}}$ - a velocity of point object, $\overrightarrow{V_{IG}}$ - a velocity of the image.

Concept of perpendicular component of velocity of image in the plane mirror:

$$(V_{MG})_{\perp} = \frac{(V_{OG})_{\perp} + (V_{IG})_{\perp}}{2}.$$

For the perpendicular z component:

$$(V_{MG})_z = \frac{(V_{OG})_z + (V_{IG})_z}{2} \to 8 = \frac{5 + (V_{IG})_z}{2}.$$

So

$$(V_{IG})_z = 11.$$

Concept of parallel components of velocity of image in the plane mirror:

$$(V_{OG})_{\parallel} = (V_{IG})_{\parallel}.$$

$x\ and\ y$ component of velocity of image will remain the same as the velocity of object.

The velocity of the image is

$$\overrightarrow{V_{IG}} = 3\vec{\tilde{A}} + 4\vec{j} + 11\vec{k}.$$

Answer: 3. $\mathbf{3\vec{\tilde{A}} + 4\vec{j} + 11\vec{k}}$.