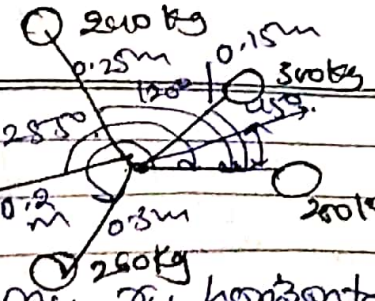
section - 1



Answer - 1
Question - 1 Analytical method.

Resolving $m_1 r_1$, $m_2 r_2$ and $m_4 r_4$ horizontally

$$\Sigma H = m_1 r_1 \cos\theta + m_2 r_2 \cos\theta + m_3 r_3 \cos\theta_3 + m_4 r_4 \cos\theta_4$$

Putting these value.

$$m_R = 40\cos 0° + 45\cos 45° + 60\cos 120 + 78\cos 255°$$
$$= 40 + 31.8 - 30 - 20.2 = 21.6 \text{ kg-m}$$

Resolving Vertically

$$\Sigma V = m_1 r_1 \sin\theta_1 + m_2 r_2 \sin\theta_2 + m_3 r_3 \sin\theta_3 + m_4 r_4 \sin\theta_4$$
$$= 40\sin 0 + 45\sin 45 + 60\sin 120 + 78\sin 255$$
$$= 0 + 31.8 + 52 - 75.3 - 8.5 \text{ kg-m}.$$

$$\text{Resultant} = R = \sqrt{dH^2 + dV^2} = \sqrt{21.6^2 + 8.5^2} = 23.2 \text{ kg-m}$$

$$mr = R = 23.2 \text{ or } m = \frac{23.2}{0.2} = 23.2/0.2 = 116 \text{ kg}$$

$$\tan\theta = \frac{dV}{dH} = \frac{8.5}{21.6} = 0.398$$

$$= 21.5$$

Angle of balancing mass from the horizontal.

$$\theta = 180° + 21.5 = 201.48°$$