
A rotor having the following properties.........

Question:
A rotor having the following properties :

m1 = 4 kg **r1 = 75 mm**
θ1 = 45o

m2 = 3 kg **r2 = 85 mm**
θ2 = 135o

m3 = 2.5 kg **r3 = 50 mm**
θ3 = 240o

Determine the amount of the countermass at a radial distance of 75 mm required for the static balance.

Answer:
Data :

m1= 4 kg   r1= 75 mm   θ1 = 45°   m1r1= 300 kg-mm
m2= 3kg   r2= 85 mm   θ2 = 135°   m2r2 = 265 kg-mm
m3= 2.5 kg   r3= 50 mm   θ3 = 240°   m3r3 = 125 kg-mm

Radius of balance mass = r = 75 mm

Let m=Balancing mass

Resolving horizontally,

$$\sum H = m1r1cos\theta1 + m2r2cos\theta2 + m3r3cos\theta3$$

= 300cos 45°+265 cos 135° +125 cos 240°

= -37.87 kg-mm   [1 M]

Resolving vertically,

$$\sum V = m1r1sin\theta1 + m2r2sin\theta2 + m3r3sin\theta3$$

= 300sin 45°+265 sin 135° +125 sin240°

291.25 kg-mm   [1M]

Resultant R= $\sqrt{(\Sigma H)^2 + (\Sigma V)^2}$

= $\sqrt{(-37.87)^2 + (291.25)^2}$

= 293.70 kg-mm

We know that

m X r = R

m = $\frac{293.70}{75}$ = 3.91 kg ……**counterbalance** mass   [2 M]