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Question:

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Answer:

Reasons for balancing of rotating elements of machine: The balancing of the moving parts both rotating and reciprocating of such machine is having greater importance. Because, if these parts are not balanced properly then the unbalanced dynamic forces can cause serious consequences, which are harmful to the life of the machinery itself, the human beings and all the property around them. These unbalanced forces not only increase the load on the bearings and stresses in various members, but also produces unpleasant and dangerous vibrations in them.

Concept of balancing: When a mass moves in circular path, it experience a centripetal acceleration which generates a force acting towards the center of rotation. An equal and opposite force which is acting radially outwards which is called centrifugal force. This force is the disturbing force for the system. The magnitude of this force remains constant but the direction goes

on changing with the rotation of mass. The centrifugal force , on a rotating machine can be expressed mathematically as follows:

$$F_c = m \cdot \omega^2 \cdot r \text{ Newton}$$

Where, m = Mass of rotating part in kg,

Ω = angular speed of this part in rad/sec, and r = Distance of the center of gravity of mass from the axis of rotation of part in m.

For the balance of rotating masses, it is the centrifugal force which is to be balanced. This type of problem is very common in steam turbine rotors, engine crank shafts, rotory compressors and centrifugal pumps.
