**Learning Objectives:**

1. State the reasons for balancing of rotating mass
2. Describe conditions to be satisfied to achieve balance in rotating bodies, understand its working and uses.
3. Apply the mathematical equations acting on the rotating body.
4. Examine and compare the calculated values with the simulation.
5. Evaluate how change in mass and position can improve the balance of the rotating body.
6. Attempt assessment questions.

**Theory**

In most of the machineries, rotating components are very common. For any given rotating component, it is required that the centre of gravity coincide with the axis of rotation. However, this may not always be possible due to various factors such as manufacturing defects, wear and tear, environmental conditions, addition of parts etc., causing eccentricity. The eccentricity results in vibrations within the component and may finally cause failure. This eccentricity in the rotating component is considered to be unbalance in force and moment, and needs to be balanced by additional forces and moments leading to minimum vibration.[1]

The balancing of rotating mass in multiple plane along the length of a shaft is a particular case of unbalance. An experiment is carried out to calculate additional masses required for balancing the unbalanced force and moment and their angular position. The purpose of the experiment is to take an unbalanced system with rotating masses and adjust the radii of the two outer masses, calculate their mass and angular positions in order to achieve a balanced system.[1]

**Equations/formulas:**

Consider m1 and m2 to be the unbalanced masses of a rotating shaft with distances r1 and r2 from its axis of the rotation. The angle between them is θ1 and distance between their planes is l1. If ra and rb are the given distances of the balancing masses from the axis of rotation, la and lb are the distances of their rotating planes from the plane of mass m1, then the balancing masses ma and mb can be calculated by considering force and moment equilibrium, assuming that the rotational speed ‘’ of the shaft is constant.

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For balancing of masses, the sum of all the forces and moments should be equal to zero.

**(i) Forces:**

**(ii) Moment:**

SOURCE: Theory-of-Machines-14th-ed-Khurmi-2005 (2)

**REFERENCE:**

[1] Theory-of-Machines-14th-ed-Khurmi-2005 (2)