

1. Loads on the Spring at the lowest and highest equilibrium speeds.

let, S_1 = Spring load at lowest equilibrium speed

S_2 = Spring load at highest equilibrium speed.

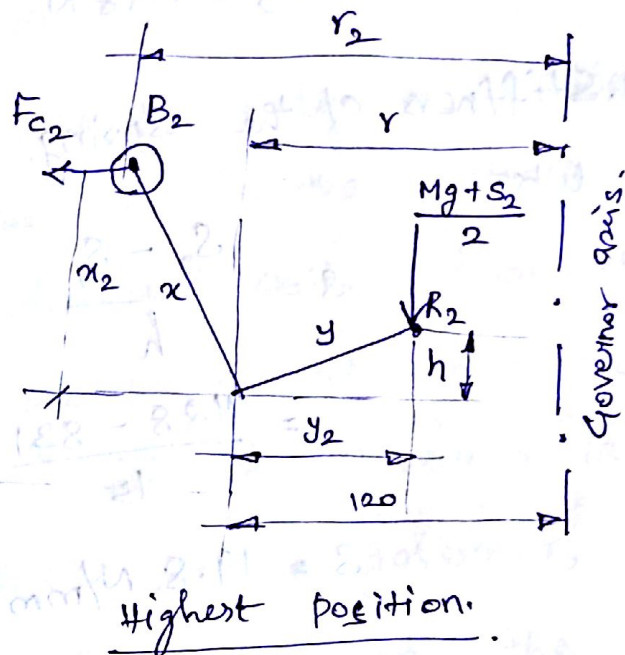
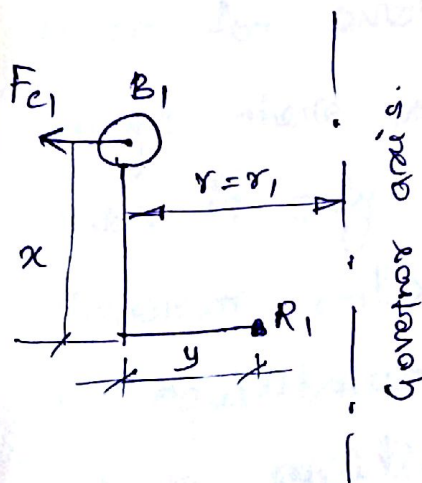
Since the ball arms are parallel to governor axis at the lowest equilibrium speed (N_1).

$$r = r_1 = 120 \text{ mm}$$

WKT, Centrifugal force $F_{c1} = m \omega_1^2 r_1 = 277 \text{ N}$.

let, r_2 = radius of rotation at N_2 .

Lowest position.



WKT,

$$h = (r_2 - r_1) \frac{y}{x}$$

$$r_2 = r_1 + h \left(\frac{x}{y} \right) = 0.1425 \text{ m.}$$

Centrifugal force at max. speed

$$F_{c2} = m(\omega_2)^2 r_2 = 376 \text{ N.}$$

Neglecting the obliquity effect of arms and the moment, due to the weight of the balls we have for lowest position.

$$M.g + S_1 = 2 F_{c1} \times \frac{x}{y}$$

$$S_1 = 831 \text{ N.}$$

and for highest position.

$$M.g + S_2 = 2 F_{c2} \times \frac{x}{y}$$

$$S_2 = 1128 \text{ N.}$$

2. Stiffness of the Spring.

WKT

$$S = \frac{S_2 - S_1}{h}$$

$$= \frac{1128 - 831}{15}$$

$$S = 19.8 \text{ N/mm.}$$

Characteristics of Governors.

1. Sensitiveness of Governor:-

The Sensitiveness is defined as the ratio of the difference between the maximum and minimum equilibrium speeds to the mean equilibrium speed.

$$\begin{aligned}\text{Sensitiveness of the governor} &= \frac{N_2 - N_1}{N} \\ &= \frac{2(N_2 - N_1)}{N_1 + N_2}\end{aligned}$$

2. Stability of Governor:-

A Governor is said to be stable when for every speed within the working range there is a definite configuration. i.e., there is only one radius of rotation of the governor balls at which the governor is in equilibrium. For a stable governor, if the equilibrium speed increases, the radius of governor balls must also increase.

3. Isochronous Governors:-

A governor is said to be isochronous when the equilibrium speed is constant.

(i.e. range of speed is zero) (i.e. $N_2 - N_1 = 0$; or $N_1 = N_2$) for all radii of rotation of the balls within the working range,

neglecting friction. The Isochronism is the stage of infinite sensitivity.

4. Hunting:-

A Governor is said to be hunt if the speed of the engine fluctuates continuously above and below the mean speed.

This is caused by a too sensitive governor which changes the fuel supply by a large amount when a small change in the speed of rotation takes place.

5. Effort of Governor:-

The effort of a governor is the mean force exerted at the sleeve for a given Percentage change of speed. (lift of sleeve)

6. Power of Governor.

The power of a governor is the work done at the sleeve for a given Percentage change of speed.

$$\text{Power} = \text{mean effort} \times \text{lift of sleeve.}$$

7. Controlling force.

When a body rotates in a circular path, there is an inward radial force or centrifugal force acting on it. In case of a governor running at a steady speed, the inward force acting on the rotating balls is known as Controlling force. It is equal to the and opposite to the Centrifugal reaction.

$$\text{Controlling force} = F_c = m\omega^2 r.$$