

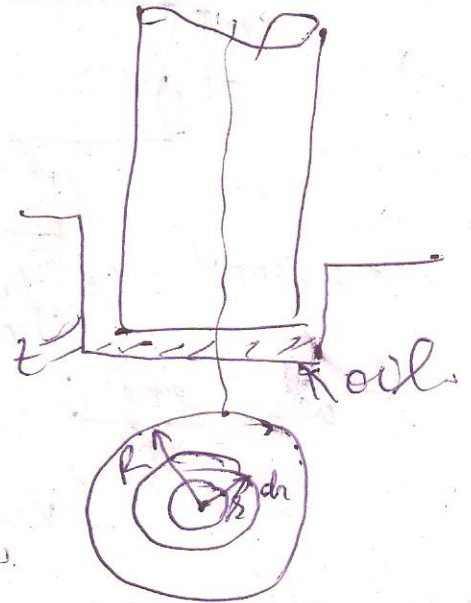
* Power absorbed in footstep bearing :-

$$v = \omega \times r \quad \text{Area of ring}$$

$$= \frac{2\pi N}{60} \times r \quad = 2\pi r dr$$

$$\tau = \mu \frac{du}{dy}, \quad \frac{du}{dy} = \frac{v}{t}$$

$$\tau = \mu \times \frac{2\pi N}{60} \times \frac{r}{t}$$



shear force

$$dF = \tau \times \text{Area of ring}$$

$$= \frac{\mu 2\pi N}{60} \times \frac{r}{t} \times 2\pi r dr$$

$$= \frac{\mu \pi^2 N r^2}{15t} dr$$

torque req^d = $dF \times r$

$$dT = \frac{\mu \pi^2 N r^3}{15t} dr$$

Total torque Re

$$T = \int_0^R \frac{\mu \pi^2 N r^3}{15t} dr = \int_0^R \frac{\mu \pi^2 N}{15t} \frac{r^4}{4}$$

$$= \frac{\mu \pi^2 N R^4}{60t}$$

$$P = \frac{2\pi NT}{60} = \frac{2\mu \pi^3 N^2 R^4}{60 \times 60t} = \frac{\mu \pi^3 N^2 R^4}{6000t}$$

* Power absorbed in collar bearing :-

till dt same as footstep bearing
now