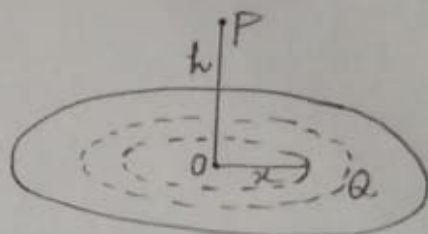


## Attraction and Potential

(1)

Q.) Find the potential of a uniform circular disc at any point on its axis.

Let  $OP = h$ , where  $O$  is the centre and  $OP$  the axis of a uniform circular disc of surface density  $\sigma$ .



Consider a concentric circular strip of radius  $OR = x$  and width  $dx$ . Each point on this strip of the disc is at a constant distance  $\sqrt{x^2 + h^2}$  from the point  $P$  on the axis.

$$\begin{aligned} \therefore \text{Potential of the strip at } P \\ = \gamma \cdot \frac{2\pi x dx \sigma}{\sqrt{x^2 + h^2}} \end{aligned}$$

$\therefore$  Potential at  $P$  of the circular disc is

$$V = 2\pi \gamma \sigma \int_0^a \frac{x dx}{\sqrt{x^2 + h^2}}$$

(where  $a =$  radius of the disc)

$$= 2\pi \gamma \sigma \left[ \sqrt{x^2 + h^2} \right]_0^a$$

$$= 2\pi \gamma \sigma (\sqrt{a^2 + h^2} - h)$$