

Chapter-22
Mensuration-III

Surface Area and volume of Right Circular cylinder.

Exercise 22.1

Q1 Find the curved surface area and total surface area of cylinder, the diameter of whose base is 7 cm and height is 60 cm.

Sol: Given, diameter = 7 cm
radius = $\frac{7}{2}$ cm.
h = 60 cm.

$$\begin{aligned}\text{Curved surface area} &= 2\pi rh = 2 \times \frac{22}{7} \times \frac{7}{2} \times 60 \\ &= 1320 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{TSA} &= 2\pi r(h+r) \\ &= 2 \times \frac{22}{7} \times \frac{7}{2} (60 + 3.5) \\ &= 22 \times 63.5 = 1397 \text{ cm}^2\end{aligned}$$

Q.2 The curved surface area of a cylindrical road is 132 cm^2 . And its height is 2.5 cm. Find The curved surface area of cylinder.

Sol: $\therefore CSA = 132$, $r = 0.35 \text{ cm}$

$$\Rightarrow 2\pi rh = 132$$

$$\Rightarrow 2 \times \frac{22}{7} \times 0.35 \times h = 132$$

$$\Rightarrow h = \frac{132 \times 7}{2 \times 22 \times 0.35} = 6 \text{ cm.}$$

Q.3 The area of the base of a right circular cylinder is 616 cm^2 and its height is 2.5 cm . Find the curved surface area of the cylinder.

Sol: Area of base = 616 cm^2

$$\Rightarrow \pi r^2 = 616$$

$$\Rightarrow \frac{22}{7} \times r^2 = 616 \Rightarrow r^2 = \frac{616 \times 7}{22} = 196$$

$$\Rightarrow r = 14 \text{ cm.}$$

$$\therefore h = 2.5 \text{ cm}$$

$$\therefore CSA = 2\pi rh$$

$$= 2 \times \frac{22}{7} \times 14 \times 2.5$$

$$= 220 \text{ cm}^2$$

Q.4 The circumference of the base of a cylinder is 88 cm and its height is 15 cm . Find its curved surface area and total surface area.

Sol: Circumference of base = 88 cm, $h = 15$ cm.

$$2\pi r = 88$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 88$$

$$\Rightarrow r = 14 \text{ cm},$$

also, $h = 15$ cm

$$\text{CSA of cylinder} = 2\pi rh$$

$$= 2 \times \frac{22}{7} \times 14 \times 15$$

$$= 1320 \text{ cm}^2$$

$$\text{TSA} = 2\pi r(h+r)$$

$$= 2 \times \frac{22}{7} \times 14 (15+14) = 88 \times 29$$

$$= 2552 \text{ cm}^2$$

Q5 A rectangular strip $25 \text{ cm} \times 7 \text{ cm}$ is rotated about the longer side. Find the total surface area of the solid thus generated?

Sol: In this case, $h = 25$ cm

radius of base = 7 cm

$$\Rightarrow 2\pi r(h+r) = 2 \times \frac{22}{7} \times 7 (25+7)$$

$$\Rightarrow 2 \times \frac{22}{7} \times 7 \times 32$$

$$= 2 \times 22 \times 32$$

$$= 1408 \text{ cm}^2$$

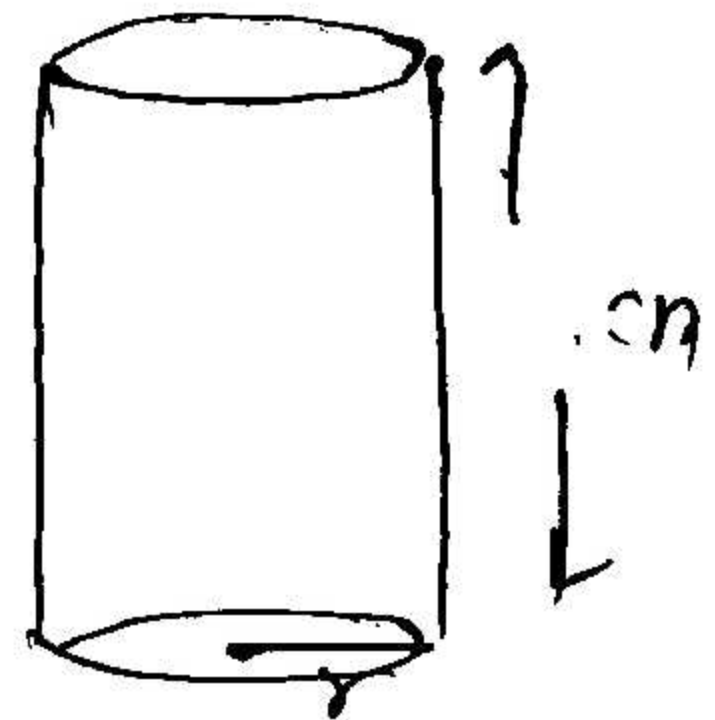
Q.6 A rectangular sheet of paper, $44\text{ cm} \times 20\text{ cm}$,
is rolled along its length to form a cylinder. Find
the total surface area of the cylinder thus generated.

Sol: In this case a cylinder of length 20 cm
and Perimeter of base 44 cm generated

$$\therefore 2\pi r = 44, \quad h = 20\text{ cm.}$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 44$$

$$\Rightarrow r = 7$$



$$\begin{aligned} \text{TSA} &= 2\pi r (h+r) = 44 \times (20+7) = 44 \times 27 \\ &= 1188\text{ cm}^2 \end{aligned}$$

Q.7 The radii of two cylinders are in the ratio
 $2:3$ and their heights are in the ratio $5:3$.
Find the ratio of their curved surface areas.

$$\text{Sol:} \quad \therefore \frac{r_1}{r_2} = \frac{2}{3} \quad ; \quad \frac{h_1}{h_2} = \frac{5}{3}$$

$$\begin{aligned} \frac{\text{CSA}_1}{\text{CSA}_2} &= \frac{2\pi r_1 h_1}{2\pi r_2 h_2} = \left(\frac{r_1}{r_2}\right) \times \left(\frac{h_1}{h_2}\right) \\ &= \frac{2}{3} \times \frac{5}{3} = \frac{10}{9} \end{aligned}$$

$$\therefore 10:9$$

(5)

Q.8 The ratio between the curved surface area and the total surface area of a right circular cylinder is $1:2$. Prove that its height and radius are equal.

Sol: we are given

$$\frac{CSA}{TSA} = \frac{1}{2}$$

$$\Rightarrow \frac{2\pi rh}{2\pi r(h+r)} = \frac{1}{2}$$

$$\Rightarrow \frac{h}{h+r} = \frac{1}{2} \quad \Rightarrow 2h = h+r$$

$$\Rightarrow 2h - h = r$$

$$\Rightarrow h = r$$

hence proved.

Q.9 The curved surface area of a cylinder is 1320 cm^2 and its base has diameter 21 cm . Find the height of the cylinder.

Sol: Diameter of base = 21 cm

$$r = \frac{21}{2} \text{ cm}$$

$$\therefore CSA = 1320$$

$$\Rightarrow 2\pi rh = 1320$$

$$\Rightarrow 2 \times \frac{22}{7} \times \frac{21}{2} \times h = 1320$$

$$h = \frac{1320}{22 \times 3} = 20 \text{ cm.}$$

Q.10 The height of a right circular cylinder is 10.5 cm. If three times the sum of the areas of its two circular faces is twice the area of the curved surface area. Find the radius of its base. (6)

Sol: we are given, $h = 10.5$ cm

$$\text{also, } 3 \times 2\pi r^2 = 2(2\pi rh)$$

$$\Rightarrow 6\pi r^2 = 4\pi rh$$

$$\Rightarrow 6r = 4h$$

$$\Rightarrow r = \frac{4}{6}h = \frac{4}{3} \times 10.5$$

$$= 7 \text{ cm}$$

$\therefore$ radius of base = 7 cm.

Q.11 Find the cost of plastering the inner surface of a well at Rs 9.50 per m^2 . If it is 21 m deep and diameter of its top is 6 m.

Sol: depth (h) = 21 m, diameter = 6 m
radius = $\frac{6}{2} = 3$ m

$$\text{CSA} = 2\pi rh = 2 \times \frac{22}{7} \times 3 \times 21$$

$$= 396 \text{ m}^2$$

$$\text{cost of plastering} = 396 \times 9.5$$

$$= \text{Rs } 3762$$

Q.12 A cylindrical vessel open at the top has diameter 20cm and height 14cm. Find the cost of tin plating it on the inside at the rate of 50 paise per hundred square centimetres.

Sol. diameter = 20cm

$$\therefore \text{radius} = \frac{20}{2} = 10\text{cm}, \quad h = 14\text{cm}.$$

$$\text{Area of tin plating} = \text{CSA} + \text{area of base}$$

$$= 2\pi rh + \pi r^2$$

$$= \pi r(2h + r)$$

$$= \frac{22}{7} \times 10 (2 \times 14 + 10)$$

$$= \frac{220}{7} (38) = 1194.28 \text{ cm}^2$$

$$\text{Rate of tin plating} = 50 \text{ paise} / 100 \text{ cm}^2$$

$$\therefore \text{Total Cost} = \frac{1194}{100} \times \frac{50}{100} = \dots$$

$$= \text{Rs } 5.97$$

Q.13 The inner diameter of a circular well is 3.5m. It is 10m deep. Find the cost of plastering its inner curved surface area at Rs 4 per square metre.

Sol. diameter of well = 3.5m

$$\text{radius} = \frac{3.5}{2} \text{m} = 1.75 \text{m}$$

$$h = 10 \text{m}$$

$$\begin{aligned}
 \text{CSA of well} &= 2\pi rh \quad 0.5 \\
 &= 2 \times \frac{22}{7} \times \frac{3.5}{2} \times 10 \\
 &= 110 \text{ m}^2
 \end{aligned}$$

$$\text{Rate of plastering} = \text{Rs } 4/\text{m}^2$$

$$\begin{aligned}
 \therefore \text{cost of plastering} &= 110 \times 4 \\
 &= \text{Rs } 440
 \end{aligned}$$

Q14 The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions moving once over to level a playground. What is the area of play-ground.

Sol: diameter of roller = 84 cm
radius = $\frac{84}{2} = 42 \text{ cm}$
 $h = 120 \text{ cm}$

$$\begin{aligned}
 \therefore \text{Area of play ground} &= 500 \times \text{CSA of roller} \\
 &= 500 \times 2\pi rh \\
 &= 1000 \times \frac{22}{7} \times 42 \times 120 \\
 &= 15840000 \text{ cm}^2 \\
 &= \frac{15840000}{10000} \text{ m}^2 = 1584 \text{ m}^2
 \end{aligned}$$

Q15 Twenty cylindrical pillars of the parliament House are to be cleaned. If the diameter of each pillar is 0.50 m and height is 4 m, what will be the cost of cleaning them at the rate of Rs 2.50 per square meter. (9)

Sol: diameter of each pillar = 0.50 m
 $\therefore$ radius = $\frac{0.50}{2} = 0.25$ m
 $h = 4$ m.

$$\begin{aligned} \text{CSA of 1 pillar} &= 2\pi rh \\ &= 2 \times \frac{22}{7} \times 0.25 \times 4 = \frac{44}{7} \text{ m}^2 \end{aligned}$$

$$\therefore \text{CSA of 20 pillars} = 20 \times \frac{44}{7} \text{ m}^2 = \frac{880}{7} \text{ m}^2$$

$$\text{Rate of cleaning} = 2.50/\text{m}^2$$

$$\therefore \text{Total Cost} = \frac{880}{7} \times 2.50 = \text{Rs } \frac{2200}{7}$$

$$= 314.28$$

$$= \text{Rs } 314.28.$$

Q16 The total surface area of a hollow cylinder which is open from both sides is 4620 sq. cm, area of base ring is 115.5 sq. cm and height 7 cm. Find the thickness of the cylinder.

Sol:

$$\text{Total surface area} = 4620 \text{ cm}^2$$

$$\text{Area of base ring} = 115.5 \text{ cm}^2$$

$$h = 7 \text{ cm.}$$

Let outer radius = $R \text{ cm}$, Inner radius = $r \text{ cm}$.

$$\begin{aligned} \therefore \text{Area of hollow cylinder} &= 2\pi(R^2 - r^2) + 2\pi Rh + 2\pi rh \\ &= 2\pi(R+r)(R-r) + 2\pi h(R+r) \\ &= 2\pi(R+r)(h+R-r) \end{aligned}$$

$$\frac{\text{Surface area}}{\text{Area of base}} = \frac{4620}{115.5}$$

$$\Rightarrow \frac{2\pi(R+r)(h+R-r)}{\pi(R+r)(R-r)} = 40$$

$$= \quad \text{Let } R-r = t$$

$$\frac{2(h+t)}{t} = 40 \Rightarrow 2h + 2t = 40t$$

$$\Rightarrow 2(7) = 38t$$

$$\Rightarrow 14 = 38t$$

$$\Rightarrow t = \frac{14}{38} = \frac{7}{19} \text{ cm.}$$

$\therefore$ thickness of cylinder = $\frac{7}{19} \text{ cm}$.

Q.17 The sum of the radius of the base and height of a solid cylinder is 37 m . If the total surface area of the solid cylinder is 1628 m^2 , find circumference of the base.

Sol!

$$\therefore r+h = 37 \text{ m.}$$

$$\text{TSA of cylinder} = 1628 \text{ m}^2$$

$$\Rightarrow 2\pi r(r+h) = 1628$$

$$\Rightarrow 2 \times \frac{22}{7} \times r (37) = 1628$$

$$\Rightarrow r = \frac{1628 \times 7}{2 \times 22 \times 37} = 7 \text{ m.}$$

$$\therefore \text{Circumference} = 2\pi r$$

$$= 2 \times \frac{22}{7} \times 7 = 44 \text{ m.}$$

Q.18 Find the ratio between the total surface area of a cylinder to its curved surface area, given that its height and radius are 7.5 cm and 3.5 cm.

Sol!

$$\text{Height of cylinder} = 7.5 \text{ cm}$$

$$r = 3.5 \text{ cm.}$$

$$\therefore \frac{\text{TSA of cylinder}}{\text{CSA of cylinder}} = \frac{2\pi r(h+r)}{2\pi rh}$$

$$= \frac{h+r}{h}$$

$$= 1 + \frac{r}{h}$$

$$= 1 + \frac{3.5}{7.5} = \frac{7.5+3.5}{7.5} = \frac{11}{7.5}$$

$$= \frac{110}{75} = \frac{22}{15} \therefore \text{Ratio} = 22:15$$

(12)

Q.19 A cylindrical vessel, without lid, has to be tin coated on its both sides. If the radius of the base is 70 cm and its height is 1.4 m. Calculate the cost of tin coating at the rate of Rs 3.50 per 1000 cm^2 .

Sol: radius of base = 70 cm, height = 1.4 m = 140 cm.

Rate of tin plating = Rs 3.5/cm²

So, Total surface area = Area of outer side of base
+ Area of inner and outer CSA

$$= 2(\pi r^2 + 2\pi rh) = 2\pi r(r + 2h)$$

$$= 2 \times \frac{22}{7} \times 70 (70 + 2(140))$$

$$= 2 \times \frac{22}{7} \times 70 \times 350 = 154000 \text{ cm}^2$$

$\therefore$ Cost of tin coating at the rate of Rs 3.50 per 1000

$$= \frac{3.50}{1000} \times 154000 = \text{Rs } 539$$