Exercise – 19.1

1. Curved surface area of a right circular cylinder is 4.4 m^2. If the radius of the base of the cylinder is 0.7 m, find its height.

Sol:

Given that

Radius of base of the cylinder $e_r = 0 \cdot 7m$

Curved surface area of cylinder $= 4 \cdot 4m^2 = 2\pi rh$

Let h be the height of the cylinder

WKT,

$2\pi rh = 4 \cdot 4m^2$

$2 \times 3 \cdot 14 \times 0 \cdot 7 \times h = 4 \cdot 4$

$(4 \cdot 4)hm - 4 \cdot 4m^2$

$h = 1m$

$\therefore$ The height of the cylinder $= 1m.$

2. In a hot water heating system, there is a cylindrical pipe of length 28 m and diameter 5 cm. Find the total radiating surface in the system.

Sol:

Given that

Height of cylinder = length of cylindrical pipe $= 28m.$

Radius (r) of circular end of pipe $= \frac{5}{2}cm = 2 \cdot 5cm$

$= 0 \cdot 025m.$

Curved surface area of cylindrical pipe $= 2\pi rh$

$= 2 \times 3 \cdot 14 \times 0 \cdot 025 \times 28 = 4 \cdot 4cm$

$\therefore$ The area of radiation surface of the system is $4 \cdot 4m^2$ or $44000cm^2$

3. A cylindrical pillar is 50 cm in diameter and 3.5 m in height. Find the cost of painting the curved surface of the pillar at the rate of 12.50 per m^2.

Sol:

Given that

Height of the pillar $= 3 \cdot 5m$

Radius of the circular end of the pillar $= \frac{50}{2}cm.$

$= 25cm = 0 \cdot 25m$

Curved surface area of pillar $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 0 \cdot 25 \times 3 \cdot 5 m^2$

$= 5 \cdot 5 m^2$

Cost of painting $1 m^2$ area – $Rs. 12 \cdot 50$

Cost of painting $5 \cdot 5 m^2$ area $= Rs.\left(5 \cdot 5 \times 12 \cdot 50\right)$

$= Rs.\ 68 \cdot 75.$

Thus, the cost of painting the CSA pillar is $Rs.\ 68, 75$

4. It is required to make a closed cylindrical tank of height 1 m and base diameter 140 cm from a metal sheet. How many square meters of the sheet are required for the same?

Sol:

Height of the cylindrical tank $\left(h\right) = 1 m.$

Base radius of cylindrical tank $\left(r\right) = \frac{140}{2} m = 70 cm$

$= 0 \cdot 7 m$

Area of sheet required – total surface area of tank $= 2\pi\left(r + h\right)$

$= 2 \times 3 \cdot 14 \times 0 \cdot 7\left(0 \cdot 7 + 1\right) m^2$

$= 4 \cdot 4 \times 1 \cdot 7 m^2$

$= 7 \cdot 48 m^2$

$\therefore$ So, it will required $7 \cdot 48 m^2$ of metal sheet.

5. A solid cylinder has total surface area of 462 cm^2. Its curved surface area is one-third of its total surface area. Find the radius and height of the cylinder.

Sol:

We have

Curved surface area $= \frac{1}{3} \times$ total surface area

$\Rightarrow 2\pi rh = \frac{1}{3}\left(2\pi rh + 2\pi r^2\right)$

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

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

$\Rightarrow 2h = r$

We know that,

Total surface area $= 462$

$\Rightarrow$ Curved surface Area $= \frac{1}{3} \times 462$

$\Rightarrow 2\pi rh = 154$

$\Rightarrow 2\times 3\cdot 14\times 2h^2 = 154$

$\Rightarrow h^2 = \dfrac{154\times 7}{2\times 22\times 2}$

$= \dfrac{49}{4}$

$\Rightarrow h = \dfrac{7}{2} cm$

$\Rightarrow r = 2h$

$\Rightarrow r = 2\times \dfrac{7}{2} cm$

$\Rightarrow r = 7cm.$

6. 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:

Let the inner radii of hollow cylinder $\Rightarrow rcm$

Outer radii of hollow cylinder $\Rightarrow Rcm$

Then,

$2\pi rh + 2\pi Rh + 2\pi R^2 - 2\pi r^2 = 4620 \rightarrow (1)$

$\pi R^2 - \pi r^2 = 115.5 \rightarrow (2)$

$\Rightarrow 2\pi h(R+r) + 2(\pi R^2 - \pi r^2) = 4620$ *and* $\pi R^2 - m^2 = 115\cdot 5$

$\Rightarrow 2\pi h(R+r) + 231 = 4620$ *and* $\pi(R^2 - r^2) = 115\cdot 5$

$\Rightarrow 2\pi\times 7(r+R) = 4389$ *and* $\pi(R^2 - r^2) = 115\cdot 5$

$\Rightarrow \pi(R+r) = 313\cdot 5$ *and* $\pi(R+r)(R-r) = 115\cdot 5$

$\Rightarrow \dfrac{\pi(R+r)(R-r)}{\pi(R+r)} = \dfrac{115\cdot 5}{313\cdot 5}$

$\Rightarrow R - r = \dfrac{7}{19} cm.$

7. 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:

For cylinder, total surface Area $= 2\pi r(h+r)$

Curved surface area $= 2\pi rh$

$$\frac{\text{Total surface area}}{\text{Curved surface area}} = \frac{2\pi r(h+r)}{2\pi rh} = \frac{h+r}{h}$$

$$\therefore \frac{\text{Total surface area}}{\text{curved surface area}} = \frac{7\cdot 5+3\cdot 5}{7\cdot 5} = \frac{11}{7\cdot 5}$$

$$= \frac{11\times 10}{7\cdot 5} = \frac{22}{15} = 22:15.$$

8. The total surface area of a hollow metal cylinder, open at both ends of external radius 8 cm and height 10 cm is 338 p cm^2. Taking r to be inner radius, obtain an equation in r and use it to obtain the thickness of the metal in the cylinder.

Sol:

Given that,

External radius $(R) = 8cm$

Height $(h) = 10cm$

The total surface area of a hollow metal cylinder $= 338\ IT\ cm^2$

We know that

$2\pi Rh + 2\pi rh + 2\pi R^2 - 2\pi r^2 = 338\pi.$

$\Rightarrow h(R+r)+(R+r)(R-r) = 169$

$\Rightarrow 10(8+r)+(8+r)(8-r) = 169$

$\Rightarrow 80+10r+64-r^2 = 169$

$\Rightarrow x^2 - 10r + 25 = 0$

$\Rightarrow r = 5$

$\therefore R - r = 8 - 5cm = 3cm$

9. 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:

Given that

$r = 70cm,\ h = 1\cdot 4m = 140cm$

$\therefore$ Area to be tin coated $= 2\left(2\pi rh + \pi r^2\right) = 2\pi r(2h+r)$

$$= 2\times\frac{22}{7}\times 70(280+70)$$

$$= 154000\,cm^2$$

Required cost $= \frac{154000\times 3\cdot 50}{1000} = Rs.539.$

10. The inner diameter of a circular well is 3.5 m. It is 10 m deep Find:

(i) inner curved surface area.

(ii) the cost of plastering this curved surface at the rate of Rs. 40 per m^2.

Sol:

Inner radius (r) of circular well $= 1 \cdot 75m$

Depth (n) of circular well $= 10m$

(i) Inner curved surface area $= 2\pi rh$

$= 2 \times \frac{22}{7} \times 1 \cdot 75 \times 10m^2$

$= (144 \times 0 \cdot 25 \times 10)m^2$

$= 110m^2$

(ii) Cost of plastering $1m^2$ area $= Rs.\ 40.$

Cost of plastering $110m^2$ *area* $= Rs.(110 \times 40)$

$= Rs.\ 4400$

11. Find the lateral curved surface area of a cylinderical petrol storage tank that is 4.2 m in diameter and 4.5 m high. How much steel was actually used, if $\frac{1}{12}$ of steel actually used was wasted in making the closed tank?

Sol:

Height (h) cylindrical tank $= 4 \cdot 5m$

Radius (r) of circular end of cylindrical tank $= \frac{4 \cdot 2}{2} m = 2 \cdot 1m.$

(i) Lateral or curved surface area of tank $= 2\pi rh$

$\Rightarrow 2 \times 3 \cdot 14 \times 2 \cdot 1 \times 4 \cdot 5m^2$

$= 59 \cdot 4m^2$

(ii) Total surface area of tank $= 2\pi r(r + h)$

$= 2\left[\frac{22}{7}\right] \times 2 \cdot 1(2 \cdot 1 + 4 \cdot 5)m^2$

$= 87 \cdot 12m^2$

Let $A\ m^2$ steel sheet be actually used in making the tank

$\therefore A\left(1 - \frac{1}{12}\right) = 87 \cdot 12m^2$

$\Rightarrow A = \left(\frac{12}{\pi} \times 87 \cdot 12\right)m^2$

$\Rightarrow A = 95 \cdot 04m^2$

Thus, $95 \cdot 04\,m^2$ steel was used in actual while making the tank.

12. The students of a Vidyalaya were asked to participate in a competition for making and decorating pen holders in the shape of a cylinder with a base, using cardboard. Each pen holder was to be of radius 3 cm and height 10.5 cm. The Vidyalaya was to supply the competitors with cardboard. If there were 35 competitors, how much cardboard was required to be bought for the competition?

Sol:

Radius of circular end of cylinder pen holder $= 3cm$

Height of pen holder $= 10 \cdot 5cm$

Surface area of 1 pen holder = CSA of penholder + Area of base of SA of 1 penholder = $2\pi rh + \pi r^2$

$= 2 \times 3 \cdot 14 \times 3 \times 10 \cdot 5 + 3 \cdot 14138$

$= 132 \times 1 \cdot 5 + \frac{198}{7} cm^2$

$= 198 + \frac{198}{7} cm^2$

$= \frac{1584}{7} cm^2$

Area of car board sheet used by 1 competitor $= \frac{1584}{7} cm^2$

Area of car board sheet used by 35 competitors $= \frac{1584}{7} \times 35cm^2 = 7920cm^2.$

13. The diameter of roller 1.5 m long is 84 cm. If it takes 100 revolutions to level a playground, find the cost of levelling this ground at the rate of 50 paise per square metre.

Sol:

Given that,

Diameter of the roller $= 84cm = 0 \cdot 84m.$

Length of the roller $= 1 \cdot 5m.$

Radius of the roller $= \frac{D}{2} = \frac{0 \cdot 84}{2} = 0 \cdot 42.$

Area covered by the roller on one revolution = covered surface area of roller

Curved surface of roller $= 2\pi rh = 2 \times \frac{22}{7} \times 0 \cdot 42 \times 1 \cdot 5$

$= 0 \cdot 12 \times 22 \times 1 \cdot 5m^2$

Area of the playground $= 100 \times$ Area covered by roller in one revolution

$= (100 \times 0 \cdot 12 \times 22 \times 1 \cdot 5) m^2$

$= 396m^2$

Now,

Cost of leveling $1m^2 = 50P = \frac{50}{100} \Rightarrow \text{Re} = \frac{1}{2}rs$

Cost of leveling $396m^2 = \frac{1}{2} \times 396 = Rs \cdot 198$

Hence, cost of leveling $396m^2$ is 198

14. 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 metre?

Sol:

Diameter of each pillar $= 0 \cdot 5m$

Radius of each pillar $(r)\frac{a}{2} = \frac{0 \cdot 5}{2} = 0 \cdot 25m.$

Height of each pillar $= 4m.$

Curved surface area of each pillar $= 2\pi rh$

$= 2 \times 3 \cdot 14 \times 0 \cdot 25 \times 4m^2$

$= \frac{44}{7}m^2$

Curved surface area of 20 pillars $= 20 \times \frac{44}{7}m^2$

Given, cost of cleaning $= Rs. 2 \cdot 50 \, per$ square meter

$\therefore$ Cost of cleaning 20 pillars $= Rs. \, 2 \cdot 50 \times 20 \times \frac{44}{7}$

$= Rs. \, 314 \cdot 28.$