

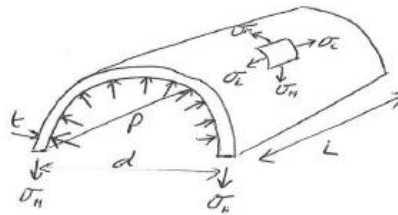
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Question No	Question	Marks
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(a)

(1)



RESOLVE VERTICALLY.

$$F \uparrow = P \times A \\ = P \times dL$$

$$F \downarrow = 2\sigma_H \times tL$$

$$\therefore 2\sigma_H tL = P dL$$

$$\therefore \sigma_H = \frac{Pd}{2t}$$

[4 MARKS]

(b) (i)

$$P_{max} = \frac{2\sigma_H t}{d} = \frac{2 \times 200 \times 10^6 \times 0.5 \times 10^{-3}}{3.5} = \underline{\underline{57 \text{ kPa}}}$$

IF SEALED AT SEA LEVEL

PRESSURE INSIDE = 101 kPa

$$\therefore \text{MIN OUTSIDE PRESSURE} = 101 - 57 \\ = \underline{\underline{44 \text{ kPa}}}$$

FROM TABLE ^{REF} ~~MIN~~ ^{MAX} ALTITUDE = 20,000 FT

(ii)

IF SEALED AT 8000 FT

PRESSURE INSIDE = 75 kPa

[4 MARKS]

$$\therefore \text{MIN OUTSIDE PRESSURE} = 75 - 57 \\ = \underline{\underline{18 \text{ kPa}}}$$

FROM TABLE ^{REF} ~~MIN~~ ^{MAX} ALTITUDE = 40,000 FT

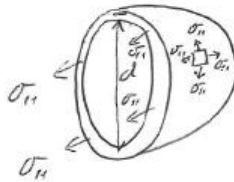
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- c) PRESSURISING THE PLANE CABIN ENABLES THE STRUCTURE TO FLY HIGHER WHERE THE AIR IS LESS DENSE & THUS FUEL EFFICIENCY IS IMPROVED (2)
- [2 MARKS]

d)



$$\begin{aligned} \text{FORCE ON SPHERE} &= p \times A \\ &= p \times \frac{\pi d^2}{4} \end{aligned}$$

$$\text{RESISTING FORCE} = \sigma_H \pi d t$$

$$\therefore \frac{p \pi d^2}{4} = \sigma_H \pi d t$$

$$\therefore \sigma_H = \frac{p d}{4 t}$$

[4 MARKS]

- e) IN TERMS OF FOOTPRINT & STORAGE CAPACITY CYLINDRICAL CONTAINERS ARE MORE COST EFFECTIVE, HOWEVER THE HOOP STRESSES ARE HALVED BY STORING FLUIDS IN SPHERES MEANING THESE FLUIDS CAN BE STORED AT HIGHER PRESSURES.

[3 MARKS]