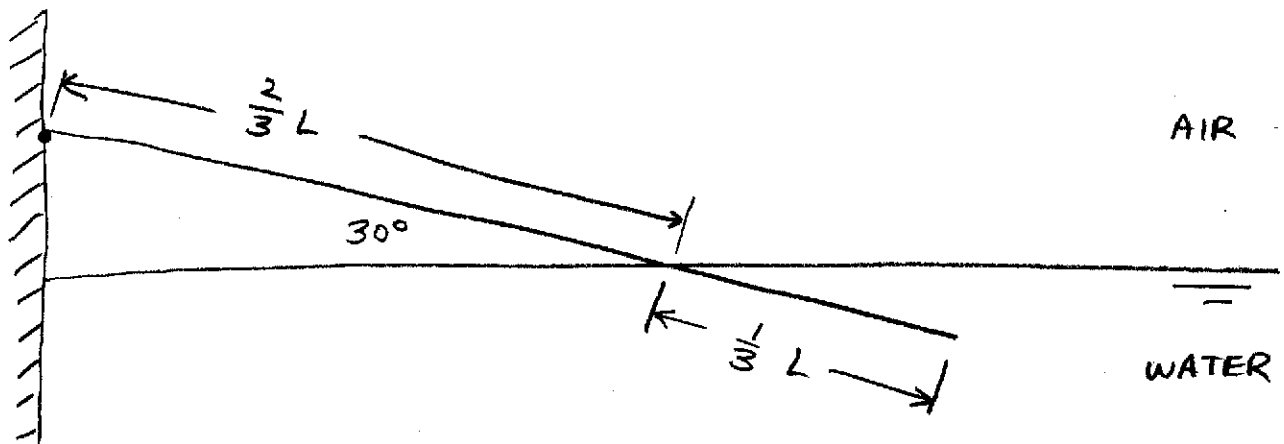
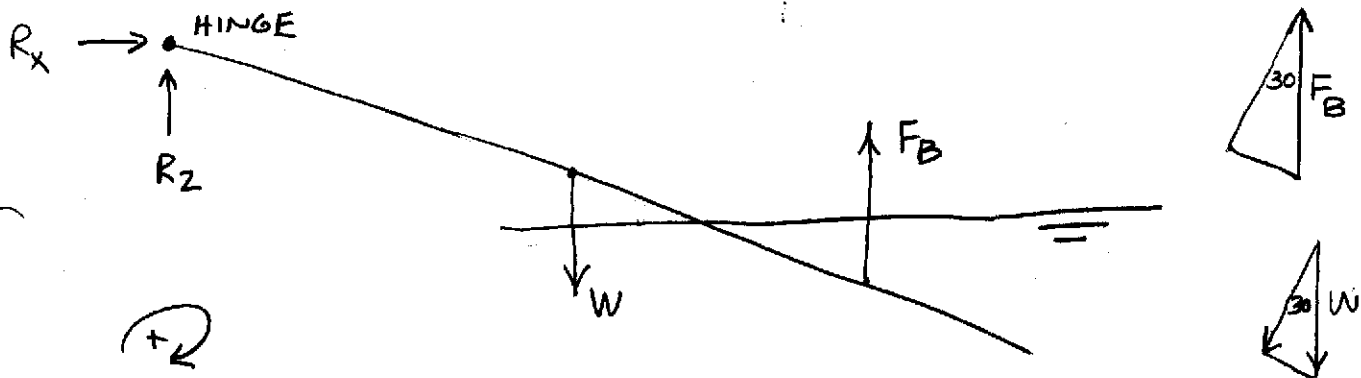


3.95 GIVEN: WOOD POLE AS SHOWN

FIND: DENSITY OF THE WOOD



SOLUTION: DRAW F.B.D. OF POLE



$$\sum M_H = 0$$

$$W \cos 30^\circ \left(\frac{L}{2}\right) - F_B \cos 30^\circ \left(\frac{2}{3}L + \frac{1}{6}L\right) = 0$$

$$\frac{W}{2} - \frac{5}{6} F_B = 0$$

$$W = \frac{5}{3} F_B$$

$$\frac{1}{2} \rho_{\text{WOOD}} - \frac{5}{6} \left(\frac{1}{3}\right) \rho_{\text{WATER}} = 0$$

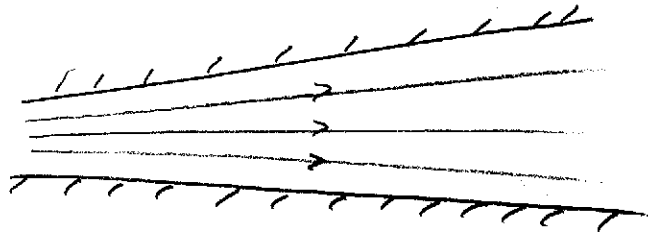
$$\rho_{\text{WOOD}} = 2 \left(\frac{5}{6}\right) \left(\frac{1}{3}\right) \rho_{\text{WATER}} = \frac{5}{9} \rho_{\text{WATER}}$$

$$\rho_{\text{WATER}} = 998 \frac{\text{kg}}{\text{m}^3}$$

$$\rho_{\text{WOOD}} = 554 \frac{\text{kg}}{\text{m}^3}$$

4.2

GIVEN: WATER FLOWS THROUGH
DIVERGING PASSAGE, FLOW RATE
IS DECREASING WITH TIME.

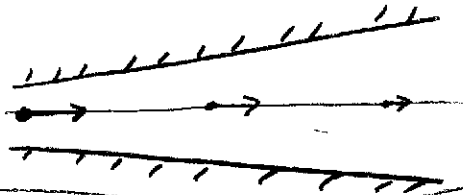


FIND: FLOW CLASSIFICATIONS.

- (a) STEADY (b) UNSTEADY (c) UNIFORM (d) NONUNIFORM

FLOW IS UNSTEADY BECAUSE FLOW RATE IS
CHANGING WITH TIME

FLOW IS NONUNIFORM BECAUSE VELOCITY ALONG
A STREAMLINE IS NOT CONSTANT. THE
DIVERGING PASSAGE CAUSES THIS.



(a) LOCAL
ACCELERATION

UNSTEADY
FLOW

(b) CONVECTIVE
ACCELERATION

DIVERGING
PASSAGE

(c) NO
ACCELERATION

4.12 GIVEN: FLOW WITH CIRCULAR
STREAMLINES AS SHOWN.

$0 \leq t \leq 1$ S : CLOCKWISE FLOW, $\omega = \pi \frac{\text{RAD}}{\text{S}}$

$1 < t \leq 2$ S : CCW FLOW, $\omega = -\pi \frac{\text{RAD}}{\text{S}}$

FIND: PARTICLE PATHLINE
STREAKLINE

SOLUTION:

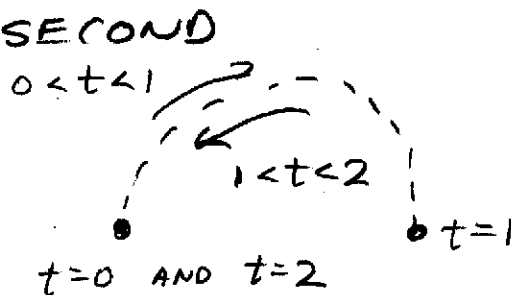
THE FLOW MOVES: $1 \text{ S} \times \pi \frac{\text{RAD}}{\text{S}} = \pi$ RADIANS

CW IN THE FIRST SECOND

THEN ROTATES π RADIANS CCW

IN THE NEXT SECOND

PARTICLE PATHLINE



STREAKLINE

