1(2.0) - H.P.M → $m = 2\left(\sqrt{1+z^2} - z\right) = 2\left(\sqrt{5} - 2\right) = 0{,}472 = R_H$

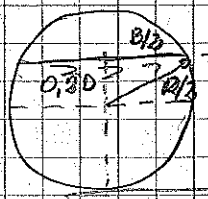
Propriedades: H.P.M → $R_H = Y_0/2$ ou pag 250 $R_H = \left(\frac{m+z}{m+2\sqrt{1+z^2}}\right) Y_0$

$\therefore Y_0 = 2R_H = 0{,}944m \rightarrow m = b/Y_0 \rightarrow b = 0{,}445m$

Manning $\frac{nV}{\sqrt{I_0}} = R_H^{2/3} \rightarrow \frac{0{,}020 \cdot V}{\sqrt{0{,}001}} = 0{,}472^{2/3} \rightarrow V = 0{,}96 m/s \rightarrow$

$A = (m+z)Y_0^2 = (0{,}472 + 2) \cdot 0{,}944^2 = 2{,}20 m^2 \rightarrow Q = 2{,}115 m^3/s$

2.(2.0) - Para $Y_0/D = 0{,}70$ Tab 8.4 → $A = 0{,}5870 D^2 \rightarrow R_H = 0{,}296 D$



$\left(\frac{D}{2}\right)^2 = (0{,}2D)^2 + \left(\frac{B}{2}\right)^2 \rightarrow B = 0{,}916D \rightarrow H_m = \frac{A}{B} = 0{,}64D$

Manning $\frac{nV}{\sqrt{I_0}} = R_H^{2/3} \rightarrow V = \frac{\sqrt{I_0}}{n} \cdot 0{,}444 D^{2/3}$

$u_* = \sqrt{\frac{\tau_0}{\rho}} = \sqrt{\frac{\gamma R_H I_0}{\rho}} = \sqrt{g R_H I_0} \rightarrow \sqrt{I_0} = u_* / \sqrt{g R_H}$

$\therefore V = \frac{u_*/\sqrt{g R_H}}{n} \cdot 0{,}444 D^{2/3} = \frac{u_*}{\sqrt{g} \cdot n} \cdot \frac{0{,}444 D^{2/3}}{\sqrt{0{,}296 D}} =$

$= \frac{u_*}{\sqrt{g} \cdot n} \cdot 0{,}816 D^{1/6} \rightarrow f_r = \frac{V}{\sqrt{g H_m}} = \frac{u_*}{\sqrt{g} \cdot n} \cdot \frac{0{,}816 D^{1/6}}{\sqrt{0{,}64 D}}$

$f_r = \frac{1{,}02 u_*}{n g} \cdot D^{-1/3}$

3.(2.0) - $H_m = B \rightarrow \frac{A}{B} = B \rightarrow A = B^2 \rightarrow \frac{D^2(\theta - \sin\theta)}{8} = D^2 \left(\sin(\theta/2)\right)^2$

$\therefore \theta - \sin\theta = 8 \sin^2(\theta/2) \rightarrow \theta = 4{,}3761 rad \rightarrow Y = D\left[1 - \cos(4{,}3761/2)\right]$

$\therefore Y/D = 0{,}789$ → Pela tabela velocidade $Y/D = 0{,}81 \rightarrow$ Não

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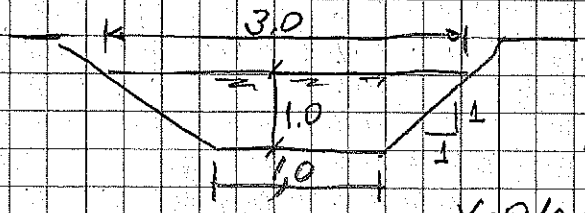
4(2.0): $m = \tau_0 = \gamma R_H I_0 = 9{,}8 \cdot 10^3 \cdot R_H \cdot 10^{-3} \rightarrow R_H = (m/9{,}8)$

Manning $\frac{nV}{\sqrt{I_0}} = R_H^{2/3} \rightarrow \frac{0{,}024 \cdot 0{,}60}{\sqrt{0{,}001}} = \left(\frac{m}{9{,}8}\right)^{2/3} \rightarrow m = 3$

Para $m = 3$ e $z = 1$ Tab 8.2 → $K = 1{,}531$ · $A = (m+z)Y_0^2 = 4Y_0^2 \rightarrow Q = VA = 2{,}4 Y_0^2$

Manning $Y_0 = \frac{M}{K} \rightarrow Y_0 = \frac{\left(\frac{0{,}024 \cdot 2{,}4 Y_0^2}{\sqrt{0{,}001}}\right)^{3/8}}{1{,}531} \rightarrow Y_0 \simeq 0{,}45 m \rightarrow b = 1{,}34 m$

5. (2,0)



$A = \frac{1}{2}(1,0+3,0)\cdot 1,0^2 = 2,0\ m^2$

$P = 1,0 + 2\cdot 1\sqrt{1+1^2} = 3,828\ m$ → $R_H = 0,522\ m$

$V = Q/A = 1,6/2 = 0,80\ m/s$ → $H_m = \frac{A}{B} = \frac{2}{3} = 0,666\ m$

1º) Modo

Chezy → $V = C\sqrt{R_H I_0}$ → $0,80 = 50\sqrt{0,522}\sqrt{I_0}$ → $I_0 = 4,9\cdot 10^{-4}\ m/m$

∴ Conclusão: $I = 0,001\ m/m \neq I_0 = 4,9\cdot 10^{-4}\ m/m$ → não uniforme

2º) Modo Eq (8.4) → $C = \frac{R_H^{1/6}}{n}$ → $50 = \frac{0,522^{1/6}}{n}$ → $n \cong 0,018$

Altura normal $Y_2 = \frac{nQ}{1,0^{8/3}\sqrt{I_0}} = \frac{0,018\cdot 1,6}{1,0^{8/3}\sqrt{0,001}} = 0,908$ → tab 8.3 → $\frac{Y_0}{b} \cong 0,83$

∴ $Y_0 \cong 0,83\ m \neq Y = 1,0\ m$ → não uniforme

$F_r = \frac{V}{\sqrt{g H_m}} = \frac{0,80}{\sqrt{9,8\cdot 0,666}} = 0,313 < 1,0$ → Fluvial

" " "

5. (0,5) → dl