

7.44

7.44 The design of a river model is to be based on Froude number similarity, and a river depth of 3 m is to correspond to a model depth of 100 mm. Under these conditions what is the prototype velocity corresponding to a model velocity of 2 m/s?

For Froude number similarity,

$$\frac{V_m}{\sqrt{g_m d_m}} = \frac{V}{\sqrt{g d}}$$

where  $d$  is the fluid depth. Thus,

$$V = \sqrt{\frac{g d}{g_m d_m}} V_m$$

and with  $g = g_m$

$$V = \sqrt{\frac{d}{d_m}} V_m = \sqrt{\frac{3 \text{ m}}{0.100 \text{ m}}} \left(2 \frac{\text{m}}{\text{s}}\right) = \underline{\underline{11.0 \frac{\text{m}}{\text{s}}}}$$