B.1 SOLUTION

$$g = \frac{2s}{t^2} \qquad \frac{\partial g}{\partial s} = \frac{2}{t^2} \qquad \frac{\partial g}{\partial t} = -2\left(\frac{2s}{t^3}\right)$$

$$t = \sqrt{\frac{2s}{g}} \qquad \frac{\partial g}{\partial t} = \frac{-4s}{t^3}$$

$$\Gamma_g^{\,2} = \left(\frac{\partial g}{\partial s}\right)^2 \Gamma_s^{\,2} + \left(\frac{\partial g}{\partial t}\right)^2 \Gamma_t^{\,2}$$

$$\Gamma_g^{\,2} = \left(\frac{2}{t^2}\right)^2 \Gamma_s^{\,2} + \left(\frac{-4s}{t^3}\right)^2 \Gamma_t^{\,2}$$

CASE I

$$s = 0.7864 \pm 0.0005\,m$$

$$t = \sqrt{\frac{2s}{g}} = \sqrt{\frac{2(0.7864)}{9.81}} = 0.40041\ s$$

$$\text{so } t = 0.40041 \pm 0.00030\,s$$

$$\Gamma_g^{\,2} = \left(\frac{2}{0.40041^2}\right)^2 (0.0005)^2 + \left(\frac{4(0.7864)}{0.40041^3}\right)^2 (0.0003)^2$$

$$\Gamma_g^{\,2} = 0.0000389 + 0.0002161$$

$$\Gamma_g = 0.0160\ m/s^2$$

CASE II

$s = 96.2 \pm 0.20\,m$

$$t = \sqrt{\frac{2s}{g}} = \sqrt{\frac{2(96.2)}{9.81}} = 4.429\,s$$

$t = 4.429 \pm 0.005\,s$

$$\sigma_g^2 = \left(\frac{2}{4.429^2}\right)(0.20)^2 + \left(\frac{4(96.2)}{4.429^3}\right)^2 (0.005)^2$$

$$\sigma_g^2 = 0.0004158 + 0.0004904$$

$$\sigma_g = 0.0300\ m/s^2$$

CASE I PROVIDES A LOWER ERROR FOR THE MEASUREMENT OF g.