SOLUTION

TQ8 [15 points]

8.1 Assuming R=6378 km (as per the table of constants)

$$\Delta x = R \cdot [(4°36'18'') - (4°35'30'')] \cdot \frac{\pi}{180} = 1.4842\ km$$

$$\Delta y = R \cdot [(74°3'19'') - (74°3'15'')] \cdot \frac{\pi \cdot cos(4,35,54)}{180} = 0.1237\ km$$

$$\Delta z = (3.100 - 3.296) = -0.196\ km$$

[2 points]

$$d_{2-3} = \sqrt{(x^2 + y^2 + z^2)} = 1.502\ km$$ [1 point]

8.2 Estimate the angular separation (in degrees) between Guadalupe (2) and Monserrate (3) as observed from the National Astronomical Observatory of Colombia (1). Take point 1 as the vertex.

Using the same method as part 8.1:

$$d_{1-2} = 2.722\ km$$ [2 points]

$$d_{1-3} = 2.580\ km$$ [2 points]

Using Cosine rule for spherical triangle,

$$cos(A) = \frac{(d_{1-2}{}^2 + d_{1-3}{}^2 - d_{2-3}{}^2)}{2\, d_{1-2}\, d_{1-2}} = 0.841$$

$$A = 32.78°$$ [2 points]

8.3

$$\alpha = tan^{-1}\left(\frac{-sin(\beta)\cdot sin(\varepsilon) + cos(\beta)\cdot cos(\varepsilon)\cdot sin(\lambda)}{cos(\beta)\cdot cos(\lambda)}\right)$$

$$\alpha = 12°43'3'' = 0h\ 50m\ 52s$$ [3 points]

$$\delta = sin^{-1}(sin(\beta)\cdot cos(\varepsilon) + cos(\beta)\cdot sin(\varepsilon)\cdot sin(\lambda))$$

$$\delta = 1°33'43''$$ [3 points]