Q18 D is correct

We apologize that the radius of the Earth was not given in the question or on the back cover of the Unit.

The magnitude of the net inward force acting on a particle at rest at the Earth's equator is $mg - R$, where R is the magnitude of the reaction force provided by the ground. The maximum possible magnitude of the inward force is mg (corresponding to $R = 0$). This maximum inward force corresponds to a critical angular speed ω_{max} of the Earth's spin:

$$m\,g = m\,\omega_{max}^2\,r_E$$

where r_E is the equatorial radius of the Earth. This gives

$$\omega_{max} = \sqrt{g/r_E} = \sqrt{9.8\ \text{m s}^{-2}/(6.38\times10^6\ \text{m})} = 1.24 \times 10^{-3}\ \text{rad s}^{-1}.$$

so the critical period of spin is $2\pi/\omega_{max} = 5070\ \text{s} = 84.5$ minutes.