BENNETT UNIVERSITY

B. Tech, Spring-2021

EPHY108L

Problem Set-4

1. You are travelling by car along the Golden Quadrangle across India. You start and end your journey at New Delhi. The total length you travelled is about 6000 km and should take about 60 h in a car driving at 100 km/h. (*a*) How much shorter than 6000 km is the distance according to the car travelers? (*b*) How much less than 60 h do they age during the trip?
2. How fast must an object move before its length appears to be contracted to one-half its proper length?
3. Two spaceships approach the Earth from opposite directions. According to an observer on the Earth, ship *A* is moving at a speed of $0.753c$ and ship *B* at a speed of $0.851c$. What is the velocity of ship *A* as observed from ship *B*? Of ship *B* as observed from ship *A*?
4. According to observer *O*, two events occur separated by a time interval $\Delta t = 0.465\mu s$ and at locations separated by $\Delta x = 53.4\ m$. (*a*) According to observer *O*', who is in motion relative to *O* at a speed of $0.762c$ in the positive *x* direction, what is the time interval between the two events? (*b*) What is the spatial separation between the two events, according to *O'*?
5. A proton has kinetic energy of 4.25 GeV. What is the ratio between its mass and rest mass?