EASTERN UNIVERSITY, SRI LANKA

SECOND EXAMINATION IN SCIENCE - 2008/2009

SECOND SEMESTER (PROPER/REPEAT)

(Sep/Oct 2010)

PH 205 RELATIVITY

Time: 01 hour.

Answer ALL Questions

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1. Define the term *Inertial frame of reference*. State the fundamental postulates of the special theory of relativity and write down the Lorentz transformation equations. Hence obtain the velocity components of a particle in space.

   A spacecraft A is moving with a speed of $2.8 \times 10^8\ ms^{-1}$ relative to the earth. A second spacecraft B is moving in the same direction of A has a speed $1.0 \times 10^8\ ms^{-1}$ relative to the spacecraft$A$. Calculate the speed of the space craft B relative to the earth. The symbols have their usual meanings.

2. Explain the meaning of length contraction and time dilation in special theory of relativity.

Consider two inertial frames S and S' having standard configuration. If two events occur along the x axis, d distance apart in the frame S simultaneously, and having corresponding separation of d' distance apart in the frame S' along the same axis, then prove that the velocity v between the frames is given by:

$$v = \left[1 - \left(\frac{d}{d'}\right)^2\right]^{\frac{1}{2}} c$$

Also show that the time interval between the occurrences of the events measured in frame S' is given by:

$$t = \left[1 - \left(\frac{d}{d'}\right)^2\right]^{\frac{1}{2}} - \left(\frac{d'}{c}\right)$$