Candidate's Index Number
Signature:

UNIVERSITY OF CAPE COAST
COLLEGE OF EDUCATION STUDIES
SCHOOL OF EDUCATIONAL DEVELOPMENT AND OUTREACH
INSTITUTE OF EDUCATION

FIVE-SEMESTER BACHELOR OF EDUCATION (SANDWICH) PROGRAMME
LEVEL 350, END-OF-FIRST SEMESTER EXAMINATIONS, APRIL 2022

APRIL 26, 2022   SPECIAL THEORY OF RELATIVITY   9:00 AM - 11:00 AM

Answer THREE questions in all, Question 1 and any other TWO questions in this Paper.

1.   **(40marks)**

    a. State the **two** postulates of special theory of relativity and show how Lorentz – transformation follows from the postulates of the special theory of relativity.

    b. What is the important dynamical effect of special theory of relativity?

    c. What is Proper time interval?

    d. The length of a rocket is measured as 100 m before launching. During the flight apparent length is found to be 96 m when measured from the launching station. Calculate its speed.

    e. Write the components of momentum in four-vector space and hence prove the invariance of $(E^2 - p^2 c^2)$

2. In actual Michelson –Morley experiment the total distance from the partially silvered mirror to each of the two mirrors was 10 meters. The wavelength of the light used was $5000\ \mathring{A}$. If the orbital velocity of the earth is taken as 30 km/s, calculate the expected total fringe shift when the apparatus is rotated through 90° .   **(30marks)**

3. Define four-vector. Show that the magnitude of momentum four-vector is $im_0 c$, where li is $\sqrt{-1}$ m_0 is rest mass and c is the velocity of light.   **(30marks)**

4. A particle of rest mass m_0 moves with a speed $\frac{c}{\sqrt{2}}$, calculate its momentum, kinetic energy and total energy.   **(30marks)**