



UNIVERSITY OF SRI JAYEWARDANEPURA
FACULTY OF APPLIED SCIENCES

B. Sc. General Degree Second Year Second Semester Course Unit Examination

March, 2021

DEPARTMENT OF PHYSICS

PHY 207 1.0 / PHY 257 1.0 / PHY 302 1.0 / PHY 327 1.0

- Special Theory of Relativity

Time : One hour

No of Questions : 04

No of Pages : 02

Total marks : 60

Answer all questions

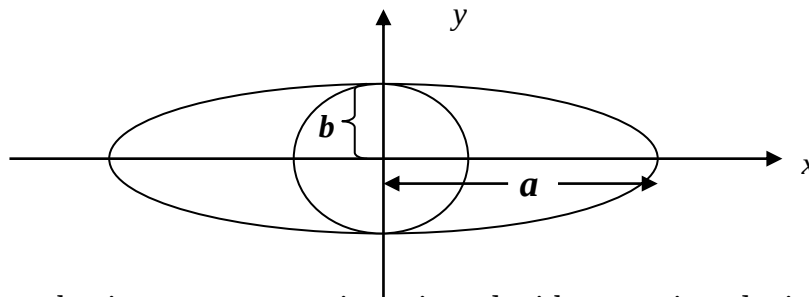
Assume, velocity of Light (c) = $3 \times 10^8 \text{ ms}^{-1}$

- 01.** Particle X, which is created in a particle accelerator, travels a total distance of 100.0 m between two detectors in 410 ns as measured in the laboratory frame before decaying into other particles.

What is the lifetime of the particle X as measured in its own frame.

(15 Marks)

02.



An ellipse having an area πab is projected with a certain velocity. It was observed that the ellipse appears as a circle of area πb^2 . Determine the velocity of projection of the ellipse. (Where, $a > b$.)

(15 Marks)

03. Let A be the twin on the earth and B be the twin in the ship in the twin paradox episode. Comment on the following statement using your knowledge of special theory of relativity.

“ The twin B can go to the future, but can not go to the past ”

(15 Marks)

04. A spacecraft moves towards the Earth with velocity $\frac{c}{2}$ as viewed from Earth's frame. The spacecraft emits light of wave length λ as measured in its own frame. The wave length of light as seen by an observer on the Earth is $6000 \text{ \AA}$. ($1 \text{ \AA} = 10^{-10} \text{ m}$)

Find the value of λ .

{You may assume that the relationship between the observed frequency and the source frequency for the above case takes the following form;

$$f_o = \frac{f_s}{\gamma (1 - \beta \cos \theta)}.$$

Where, $\gamma = \frac{1}{\sqrt{1 - \beta^2}}$, $\beta = \frac{v}{c}$ and other symbols have their usual meanings. }

(15 Marks)
