NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI - ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF PHYSICS
2025_1 EXAMINATION

COURSE CODE: **PHY 303**
COURSE TITLE: **SPECIAL RELATIVITY**
CREDIT UNIT: **2**
TIME ALLOWED: **(2 HRS)**
INSTRUCTION: ***Answer question 1 and any other two questions***

QUESTION 1

(a) When is a frame of reference said to be inertia? **(7marks)**
(b) What is Galilean transformation used for? **(5marks)**
(c) Explain Einstein's simultaneity **(8marks)**
(d) Define the following terms:
(i) length contraction
(ii) An event **(7marks)**
(e) What is world point? **(3marks)**

QUESTION 2

(a)Using the Galilean transformation write down the Newton's 2nd law of motion for each $s\ and\ s^1$ frame. **(8marks)**
(b) Write out the Lorentz factor and explain the symbols. **(5marks)**
(c) If a rod is to appear shrunk by half along its direction of motion, at what speed should it travel? **(7marks)**

QUESTION 3

(a) Explain the term length contraction **(6marks)**
(b) Define the Lorentz-Fiterald contraction **(5marks)**
(c) At the time a spaceship moving with speed $v = 0.5c$ passes a space station located near mars, a radio signal is sent from the station to earth. This signal is received on earth $1{,}123s$ later. how long does the signal take to reach the ship as measured by the crew of the spaceship if it arrives at 2250s. **(9marks)**

QUESTION 4

(a). Explain why inertial mass and gravitational mass are not practically the same? **(5marks)**
(b) Write down the Einstein's mass energy equation and explain the symbols **(6marks)**
(c) What is the energy required to accelerate an electron from rest to velocity $0.6c$?**(9marks)**

QUESTION 5

(a)-(i) Explain what is meant by doppler effect **(4marks)**
(ii) Define the term proper length **(4marks)**
(b)-Explain the term, orthogonal transformation **(4marks)**
(c)-Find the Doppler shift in wavelength of H line at $6{,}565$Å emmited by a star receding with a relative velocity of $3 \times 10^6 ms^{-1}$ **(8marks)**