UNIVERSITY OF SCIENCE - VNU-HCM
FINAL EXAM
Semester 2 – Academic Year 2023-2024

MÃ LƯU TRỮ (*do phòng KT-ĐBCL ghi*)

Course:	**Principles and Applications of Accelerators**	**Code:**	**MPH10114**
Exam duration:	**90 minutes**	Date:	**06/06/2024**

Note: *Students [☒ are allowed / ☐ are not allowed] to use materials during the exam.*

Student's name: …..... Student's ID: …… No: …..

Note: Constants and related data are looked up from references.

Question 1: (2 points) State the basic differences between Cyclotron and Synchrotron accelerators?

Question 2: (1 point) Why can accelerators be used to study particles with very small sizes and particles with very large masses?

Question 3: (3 points): An accelerator has 42 drift tubes controlled by alternating voltage with a frequency of 100 MHz. Protons are shot into the first drift tube and when passing through each slit, they are accelerated by 500 keV. The length of the longest drift tube is 32 cm.

a) Calculate the initial energy of the protons shot into this accelerator

b) If this accelerator wants to accelerate the protons to an energy of 50 MeV, how many more drift tubes are needed?

Question 4: (1 point) For a relativistic particle with charge e moving in a circular orbit of radius R in a magnetic field B perpendicular to the orbit plane, prove that $p = 0.03\ B.R$, in which p is the momentum calculated in (GeV/c) and B (kG) and R (m).

Question 5: (3 points) Protons are accelerated in a synchrotron with a radius of curvature

R = 10 m, magnetic induction B = 1.2 T. Determine:

a) The kinetic energy of the proton

b) The rotation frequency of the proton

(The exam consists of 1 page)

Exam Author Name/Staff Code: Van Thi Thu Trang **Signature:** .....

Exam Reviewer Name: .....**Signature:** .....