1059

M.Sc. (Physics) Fourth Semester
PHY-7056: Particle Accelerator Physics

Time allowed: 3 Hours   Max. Marks: 60

NOTE: *Attempt* <u>*five*</u> *questions in all, including Question No. IX (Unit-V) which is compulsory and selecting one question each from Unit I -IV.*

x-x-x

UNIT – I

I. Describe various kinds of ion sources used in the particle accelerators? Compare between an ECR and a negative ion source.   (12)

II. What are the different types of focusing and beam transport devices used in an accelerator. Describe in detail each focusing devices.   (12)

UNIT – II

III. What is a cyclotron? Derive its working principle. What is the difference between a Synchrocyclotron and a AVF cyclotron?   (12)

IV. Explain the basic principle of a linear accelerators? Describe the use of different types of wave guides used in a linear accelerator.   (12)

UNIT – III

V. Describe in detail the working principle of a tandem electrostatic accelerator? Compare between a Pelletron and a Tendetron.   (12)

VI. What is a heavy ion linear accelerator? Describe it's working principle. What kind of time structure of beam one can expect from a typical heavy ion linear accelerator.

                                                                                                              (12)

UNIT – IV

VII. Describe the principle of production of Radioactive ion beams (RIB) by Isotope separator online (ISOL) and projectile fragmentation (PF) method. Compare both the methods in terms of advantages and disadvantages.   (12)

VIII. What is synchrotron radiation? Explain in terms of the electromagnetic radiation from relativistic electron beams and describe synchrotron radiation spectrum in detail. (12)

UNIT – V

IX. Attempt the following:-

a) How the divergence of the beam is measured?

b) What is the meaning of beam phase stability in an accelerator?

c) What is a multipole wiggler?

d) What is the usual method for measuring the energy of the beam in a Tandeam accelerator?

e) What is colliding beam accelerators?

f) What is the meaning of cooling of beam in Radio-active ion beam production? (6x2)

x-x-x