

### Question-1

A particle of mass  $m = 5 \text{ kg}$  is entering a region of homogenous magnetic field  $\mathbf{B}$  with a velocity  $\mathbf{u}$ . File *B.dat* gives the three components of the magnetic field vector in two different cases, and file *u.dat* gives the three components of the velocity vector  $\mathbf{u}$ . Use *numpy.loadtxt* to read these files. And calculate (i) the magnitude of acceleration  $\mathbf{a}$  experienced by the particle at the time of entry and (ii) the angle between  $\mathbf{a}$  and  $\mathbf{B}$ .

### Question-2

The file *opt.dat* gives the AB magnitude of a GRB afterglow in different filters as a function of time measured since burst. See the columns for description. Plot the lightcurves (flux vs time) I band alone. Use the function *mask* to separate out the particular band. Show that the temporal evolution is a power-law.

Conversion for AB magnitude to flux ( $f_\nu$  in cgs units) is

$$m_{\text{AB}} = -2.5 \log_{10} f_\nu - 48.6.$$