



Reg. No:

Date: 23-11-2020

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27

M.Sc. Physics-III SEMESTER

SEMESTER EXAMINATION: NOVEMBER 2020

PH9518- ASTROPHYSICS SOFTCORE

Time: 90 mins

Total Mark:35

Answer any **FIVE** questions. Each question carries 7 marks

[5X7=35]

- 1) Write a note on the Equatorial Coordinate system. Convert RA of  $3^{\text{h}} 18' 20.38''$  to degrees. What do you understand by local sidereal time? With the help of a diagram obtain an expression for the local hour angle in terms of local sidereal time and RA of a celestial object?
- 2) Estimate the time taken for a photon to diffuse out of the sun. Also determine its central pressure and temperature. What are the assumptions involved while making these estimates? Given:- Radius of the sun  $\sim 7 \times 10^8$  m, mean free path of photon  $\sim 0.5$  cm, Mass of the sun  $2 \times 10^{30}$  kg.
- 3) Differentiate between flux and luminosity of a star. What do you understand by the stellar magnitude scale? How is the absolute magnitude of a star defined? If you have an extended object like a galaxy, can we define a magnitude scale similarly? Explain.
- 4) How do we measure the distance to a star using parallax method as well as Cepheid variable stars? Explain how it led to Hubble's law.
- 5) What are the main reasons for using a telescope? What do you understand by *diffraction limit of a telescope* as well as *the practical diffraction limit*? What do you understand by aperture synthesis?
- 6) Differentiate between Poissonian and Normal distributions. What are the assumptions involved if you have to use poissonian statistics? Experimentally how will you differentiate between these two distributions? If you have an option of conducting astronomical observation of 20 minutes duration or two observations of 15 and 5 minutes duration each, which one will you choose? Why?
- 7) Obtain expressions for the free-fall and the sound crossing (or oscillation) time scale as well as Jeans length. What is the physical significance of Jeans length? If the present day Cosmic Microwave Background Radiation temperature and mean matter density are 2.7 K and  $\sim 10^{-28}$  kg/m<sup>3</sup> respectively, estimate the Jeans length of a gas cloud when matter and radiation decoupled. Assume that the temperature of this epoch is approximately 3000 K.