

6. (a) Explain the meaning of differential rotation of galaxy? Write different features of Milky way galaxy.
- (b) Draw the tuning fork diagram of galaxy classification given by Hubble. Based on this diagram explain Hubble's scheme of galaxy classification. (10,8)

**Some important physical constants:**

|                        |                                                      |
|------------------------|------------------------------------------------------|
| Mass of Sun            | $M_{\odot} = 2 \times 10^{30} \text{kg}$             |
| Radius of Sun          | $R_{\odot} = 7 \times 10^8 \text{m}$                 |
| Temperature of Sun     | $T_{\odot} = 5800 \text{K}$                          |
| Luminosity of Sun      | $L_{\odot} = 4 \times 10^{26} \text{W}$              |
| Solar Constant         | $S = 1400 \text{m/m}^2$                              |
| Boltzmann Constant     | $k_B = 1.38 \times 10^{-23} \text{J/K}$              |
| Wein's Cosnatnt        | $b = 0.00289 \text{m K}$                             |
| Gravitational Constant | $G = 6.6 \times 10^{-11} \text{Nm}^2 \text{Kg}^{-2}$ |
| Hubble Constant        | $H_0 = 70 \text{Km / s / Mpc}$                       |
| One Astronomical Unit  | $1 \text{AU} = 1.5 \times 10^{11} \text{m}$          |
| One Light year         | $1 \text{Ly} = 9.46 \times 10^{15} \text{m}$         |
| One parsec             | $1 \text{pc} = 3 \times 10^{16} \text{m}$            |

[This question paper contains 4 printed pages.]

**Your Roll No.....**

**Sr. No. of Question Paper : 5126**

**J**

Unique Paper Code : 2224001001

Name of the Paper : Introductory Astronomy

Name of the Course : **B.Sc. Hons. - (Physics)\_NEP: UGCF-2022**

Semester : IV / VI (GE)

Duration : 3 Hours

Maximum Marks : 90

**Instructions for Candidates**

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **five** questions in all, including Question No. **1** which is compulsory.
3. All questions carry equal marks.

1. Answer the following questions (Attempt **Any Six**)

(a) Write difference between radiant flux and luminosity of a star.

- (b) How does the rotation velocity curve of the Milky Way indicate the presence of dark matter?
- (c) Why exoplanets having their parent star with high mass which belongs to main sequence of HR diagram have minimum probability for life to evolve?
- (d) Spectral type of two stars are A-type and O-type. Determine the wavelength at which each star emit maximum radiant flux.
- (e) Explain the origin of spring tides and neap tides related to Earth-Moon system.
- (f) Name three Indian observatories along with the type of telescope placed in these observatories.
- (g) Explain proper motion of stars with an example.  
(6×3=18)
2. (a) Explain with the help of labelled diagram the Equatorial coordinate system used to find an astronomical object on celestial sphere.
- (b) Zenith distance of Sun when the Sun crosses the observer meridian is  $30.0^\circ$ . Draw celestial sphere and locate Sun on the observer meridian for an observer at Rishikesh (Latitude  $\phi \approx 30.0^\circ$ ), India. Find altitude of the Sun when Sun is on the observer meridian.  
(12,6)

3. (a) Explain the meaning of limiting-magnitude of a telescope. How does the diameter of a telescope affect its' limiting-magnitude?
- (b) Define resolving power of a telescope. Estimate the resolving power of Hubble Space Telescope whose diameter is 2.4m. Given that the wavelength of observation is 600nm.  
(12,6)
4. (a) Draw a labelled Hertzsprung-Russell (HR) diagram. For stars belonging to different regions in the HR diagram, explain how the size of the star is estimated from the information displayed on the HR diagram?
- (b) A star has an effective temperature  $T_{\text{eff}} = 10,000\text{K}$ , absolute magnitude of  $M = +1.6$  and apparent magnitude  $m = +7.2$ . Find star distance (in parsec) and luminosity (in terms of solar luminosity). Given that absolute magnitude of Sun is  $M_{\text{Sun}} = +4.7$ .  
(12,6)
5. (a) Draw labelled diagram of Sun's atmosphere. Explain the variation of temperature with height in Sun's atmosphere.
- (b) Explain Hubble law related to expansion of universe. What does the slope of a velocity vs. distance graph represent in Hubble's Law?  
(12,6)