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Reg. No. : .....

Name : .....

Fourth Semester M.Sc. Degree Examination, June 2025

Physics with Specialization in Space Physics

Special Paper

PHSP 543 : INTRODUCTION TO ASTROPHYSICS

(2020 Admission Onwards)

Time : 3 Hours Max. Marks : 75

SECTION – A

Answer any **five** questions. Each question carries **3** marks.

1. Briefly explain the alt-azimuth coordinate system.
2. Discuss any one method to find the distances to a celestial object,.
3. What are the important properties that decide the observation capabilities of an optical telescope?
4. Describe the triple-alpha reaction.
5. Write a short note on neutron stars.
6. Discuss the properties of our Galactic center.
7. What are the different types of spiral galaxies?
8. Write the Hubble's law. Briefly explain the concept of Standard candles.

(5 × 3 = 15 Marks)

P.T.O.

SECTION – B

Answer **three** questions. Each question carries **15** marks.

9. (a) Briefly explain the Saha - Boltzmann equation and its importance in astrophysics. (10)

   (b) Discuss the Harvard spectral classification of stars. (5)

OR

10. (a) Discuss the different magnitude systems and explain the method to derive the luminosity of stars. (10)

    (b) The color of a star is an indicator of its temperature. Explain. (5)

11. (a) The protostar formation does not happen in all the molecular clouds. Describe the formation of a protostar and the relevant conditions for the formation. (10)

    (b) How do H II regions are formed near some stars? Mention its properties. (5)

OR

12. (a) Discuss with the necessary conditions for the occurrence, the three modes of energy transport inside stars. (10)

    (b) What are the two important hydrogen-burning reactions in stellar interiors? (5)

13. (a) Briefly explain the structural components of the Milky Way galaxy. (10)

    (b) Explain the physical significance of the rotation curve of the galaxy. (5)

OR

14. (a) Discuss the morphological classification of galaxies with the help of the Hubble tuning fork diagram. (12)

    (b) Differentiate between galaxy groups and galaxy clusters. (3)

(3 × 15 = 45 Marks)

SECTION – C

Answer any **three** questions. Each question carries **5** marks.

15. Find the altitude and azimuth of the Moon in Helsinki at midnight at the beginning of 1996. Given RA = 2 h 55 mm 7s and Dec = 14 degrees 42 minutes. The latitude = 60.16 degrees and sidereal time = 6 h 19 mm 26 s.

16. The V magnitude of a star is 15.1, B – V = 1.6 and absolute magnitude M_v = 1.3. The extinction in the direction of the star in the visual band is A_v = 1 mag kpc^{-1}. What is the intrinsic color of the star?

17. Star A appears 50 times brighter than Star B. The magnitude of star A is 1.4. What is the magnitude of star B?

18. The mass of Vega (spectral class AOV) is 2 $M_\odot$, the radius 3 $R_\odot$ and luminosity 60 $L_\odot$. Find its nuclear time scale.

19. The effective temperature of a star is 12,000 K and the absolute bolometric magnitude 0.0. Find the radius of the star, when the effective temperature of the Sun is 5000 K and the absolute bolometric magnitude 4.7.

20. The rest wavelength of Lyman - α line is 121. Find the redshift required to bring this light into the visible region. Assume the blue end of the spectrum is at 400 nm.

(3 × 5 = 15 Marks)