Total pages: 02

PG (CBCS)
M.SC. Semester- III Examination, 2023
PHYSICS
PAPER: PHS 303D
(ASTROPHYSICS-I)

Full Marks: 40 **Time: 2 Hours**

The figures in the right-hand margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Write the answer for each unit in separate sheet

UNIT: PHS 303D.1
ASTRONOMICAL METHODS

GROUP-A

Answer any **TWO** of the following questions: 2×2=4

1. What is distance modulus?
2. Define zenith and nadir.
3. Discuss shortly about the relation between luminosity, temperature and radius of a star.
4. What will the local time of Shillong be when the local time of Ahmedabad is 6 p.m.? Longitude and latitude of Ahmedabad are 72° 44′E and 23° 08′N respectively and that of Shilong are 91° 52′E and 25° 34′N respectively.

GROUP-B

Answer any **TWO** of the following questions: 2×4=8

1. Define parsec. A satellite measures the parallax angle of a star as 0.005 arc-second. What is the distance of the star? 2+2
2. What is the relation between light year and parsec? Describe how you can measure radius of a star using Stefan-Boltzmann law. 1+3
3. Explain the physics of 21 cm radio emissions from neutral hydrogen atoms. Calculate the energy of this wavelength.
4. The apparent magnitude of the Sun is −26.8. Find its absolute magnitude. Remember that the distance between the Sun and the Earth is 1.5×10^{13} cm.

GROUP-C

Answer any **ONE** of the following questions: 1×8=8

1. What is the relationship between brightness and apparent magnitude of a star? Compare the brightness of the Sun and Sirius A if apparent magnitude of Sun and Sirius A are -26.81 and -1.47 respectively. If a star at 40 pc is brought closer to 10 pc, i.e., 4 times closer, how bright will it appear in terms of the magnitude? 2+3+3

P.T.O

2. Describe equatorial coordinate system. What is Vernal equinox and local sidereal time (LST)? 4+2+2

UNIT: PHS 303D.2
STELLER STRUCTURE AND EVOLUTION

GROUP-A

Answer any **TWO** of the following questions: 2×2=4

1. The radius of a white dwarf is 10^5 km and solar mass is 2×10^{30} kg. Calculate the density of the star.
2. What is the chemical composition of the photosphere of Sun?
3. The angular diameter of the Sun is 32′ and mean solar distance is 1.5×10^{11} m. Calculate the radius of the Sun.
4. What do you mean by Helioseismology?

GROUP-B

Answer any **TWO** of the following questions: 2×4=8

1. If solar constant is $S = 1370\ Wm^{-2}$ and mean solar distance is 1.5×10^{11} m, calculate the solar luminosity L_o.
2. One of the four Galilean satellites of the planet Jupiter is Io. Its orbital period is 1.77 days. The semi-major axis of its orbit is 4.22×10^{10} cm. Calculate the mass of Jupiter under the assumption that the Jupiter is too massive in comparison to Io.
3. Write down the nuclear chain reactions involved in CNO cycle.
4. Derive the Equation of Hydrostatic Equilibrium inside a star.

GROUP-C

Answer any **ONE** of the following questions: 1×8=8

1. What is the Virial theorem related to the interior of a star? From the Virial theorem, show the relationship between average temperature, mass and density of a star. 3+5
2. Describe different layers of solar atmosphere. What do you mean by butterfly diagram? Describe with figure. 4+4

******