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PG CBCS
M.Sc. Semester-III Examination 2020
PHYSICS
PAPER: PHS 303D

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

Write the answer for each unit in separate sheet

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

Group A

303D.1: Astronomical Methods

Marks: 20

Answer any two questions of the following: **10×2=20**

1. What do you mean Absolute Magnitude of a star? What is distance modulus? Write down the relationship between Luminosity and Absolute Magnitude. 3+4+3
2. Describe how you will measure mass of a visual binary star. How stellar radii are related to the absolute magnitudes and temperatures of a star? 6+4
3. The mass of star Sirius is thrice that of the Sun. Find the ratio of their luminosities and the difference in their absolute magnitudes. Taking the absolute magnitude of the Sun as 5, find the absolute magnitude of Sirius.

   The apparent magnitude of full moon is − 12.5 and that of Venus at its brightest is − 4.0. Which is brighter and by how much? 6+4
4. A and B are two places in north latitude on the surface of the Earth; their latitudes are 24° 18′N and 36° 47′N, respectively; and their longitudes are 133° 36′E and 125° 24′W, respectively. Find the difference in their local time.

   Show that a star attains its maximum altitude when it is on the observer's meridian. 5+5
5. What do you mean by right ascension (RA) and declination? How is local sidereal time (LST) related with hour angle and right ascension (RA)? Explain. 5+5
6. Write down the basic equation of the radiative transfer. What do you mean by Faraday rotation? How can you measure magnetic field of an astronomical system using Faraday rotation. 3+3+4

Group B

303D.2: Steller Structure and Evolution

Marks: 20

Answer any two questions of the following: 10×2=20

1. Draw a schematic diagram showing the layers of solar atmosphere. Why does the temperature in the chromosphere increase with height? 6+4
2. What do you mean by van Allen radiation belts? How does the cooler regions in Sun-spot survive for long time amidst the hotter regions? 5+5
3. 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. Assume that the Sun radiates like a black body at temperature T. Calculate T using Stephan-Boltzmann law. Assume standard value of Stephan constant. 6+4
4. The temperature inside a sunspot is 4000 K and that of its surface is 6000 K. Calculate the strength of the magnetic field inside the sunspot which will balance the pressure inside and outside. The number density of particles (assume hydrogen) in the photosphere is 10^{20} particles per cm^{-3} and the strength of the magnetic field of the Sun is 1 G.
5. Describe the butterfly diagram of sin-spot cycle. Derive the mass continuity equation of a star. 5+5
6. Describe different models of energy transfer in Sun.

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