



WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2022

PHSADSE05T-PHYSICS (DSE3/4)

ASTRONOMY AND ASTROPHYSICS

Time Allotted: 2 Hours

Full Marks: 50

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer Question No. 1 and any two questions from the rest

1. Answer any *fifteen* questions from the following: 2×15 = 30
- (a) Draw a schematic diagram of different layers of the Sun's atmosphere.
 - (b) With the help of a diagram and proper labelling, describe the Horizon Coordinate system.
 - (c) A main sequence star has mass $10M_{\odot}$. Compute the luminosity of the star in terms of L_{\odot} . Where M_{\odot} and L_{\odot} are mass and luminosity of Sun respectively?
 - (d) What is the qualitative difference between a main sequence star and a compact star?
 - (e) Why is the temperature of sunspots lower than their surrounding?
 - (f) What is active galaxy? Give one such example.
 - (g) Give arguments in support of the expanding universe.
 - (h) The apparent magnitude of the full Moon is -11.7 and that of the Sun is -26.7 . Compare their brightness.
 - (i) A galaxy of absolute magnitude of -20 is at a distance of 100 Kpc. Would it be visible to the unaided eye? Give explanations.
 - (j) What do you understand by the hydrostatic equilibrium of a star?
 - (k) Calculate the magnitude of the faintest object that a 3.5 m telescope can detect, if the naked eye with a pupil of diameter 5 mm can see down to 6 magnitude.
 - (l) The masses of four main sequence stars are $15M_{\odot}$, $10M_{\odot}$, $5M_{\odot}$ and $1M_{\odot}$. Place them correctly on the H-R diagram.
 - (m) What do you mean by Sidereal time? What is the difference between the solar day and sidereal day?
 - (n) What is flash spectra?
 - (o) How galactic distance can be measured using Cepheid variables?
 - (p) State de Vaucouleurs law for galaxies.

- (q) Find the temperature at which the number density of hydrogen atoms in the fundamental state is equal to that of its second excited state.
- (r) Estimate the age of the universe, given that the Hubble's Constant is $70 \text{ km sec}^{-1} \text{ Mpc}^{-1}$.
- (s) Write down the complete chain of reactions of the CNO-cycle inside a main sequence star.
- (t) Explain, why gas in elliptical galaxies is expected to be hot.
2. (a) Explain the equatorial system of coordinates with the help of a diagram. 4
- (b) What are the factors which determine the resolving power of a telescope? How does light gathering power of a telescope affect its resolving power? 1+2
- (c) Calculate the diffraction limit of resolution of a 3 m telescope for the wavelength of 600 nm. 3
3. (a) Draw the differential rotation curve of Milky Way galaxy. Hence explain that how this leads to the prediction of Dark Matter in the Universe. 1+4
- (b) Compute the size of a star in terms of the radius of Sun, R_{\odot} , if the star's surface temperature is 5000 K and luminosity is $5L_{\odot}$. Assume the surface temperature of sun is 6000 K. 2
- (c) A star, made up of hydrogen, has a mass of 10^{33} gm and radius of 10^{11} cm . Determine the order of magnitude of the average temperature in the interior of the star in units of Kelvin. Given that, Gravitational Constant, $G \approx 10^{-7}$, Boltzmann Constant, $k_B \approx 10^{-16}$, mass of hydrogen atom, $m_H \approx 10^{-24} \text{ gm}$. 3
4. (a) Suppose that the surface temperature of two stars A and B is the same and the luminosity of star A is higher than star B. Which of the two stars is bigger in size? Explain your answer. 4
- (b) Explain briefly the spectral classification of stars. 4
- (c) Discuss the characteristics of Globular Clusters. 2
5. (a) Briefly describe the nebular model of the origin of the solar system. What features of the solar system is this model able to account for? 5+1
- (b) What are the advantages of reflecting telescope over refracting telescope? 2
- (c) What is magnetic flux freezing? 2

N.B. : Students have to complete submission of their Answer Scripts through E-mail / Whatsapp to their own respective colleges on the same day / date of examination within 1 hour after end of exam. University / College authorities will not be held responsible for wrong submission (at in proper address). Students are strongly advised not to submit multiple copies of the same answer script.

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