# WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 6th Semester Examination, 2021

## PHSADSE05T-PHYSICS (DSE3/4)

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) The luminosity of a star is 10 times, the luminosity of the Sun. Calculate the difference in their absolute magnitudes.

(b) What do you mean by 'mean sun'?

(c) What are Solar Flares? What is the source of energy in solar flares?

(d) What are the differences between absorption and emission spectra of stars?

(e) With the help of a diagram with proper labelling, describe the Equatorial Coordinate System.

(f) Show that the altitude of the pole star is equal to the latitude of the observer.

(g) Define nautical mile.

(h) Estimate the radius of a typical star in terms of the radius of the Sun. It is given that the star's temperature is two-thirds that of the Sun and its luminosity is 100 times the luminosity of the Sun.

(i) Our nearest star Proxima Centauri makes a parallax of 0.75 arc sec. How far is it from the earth?

(j) Explain the term geodesic.

(k) Why does 'limb darkening' happen?

(l) What is meant by electron degeneracy pressure?

(m) Distinguish between spiral and elliptical galaxies giving one example of each type.

(n) Calculate the diffraction limit of resolution of a telescope of diameter 5 m for $\lambda$ = 457 nm.

(o) What are the different parts in atmospheric window? How are these formed?

(p) Why does the O type stellar spectra form at high temperature?

(q) Explain why older galaxies should be redder.

(r) Briefly explain the physical significance of 'main sequence' on H-R diagram.

(s) State Hubble's law and explain its significance.

(t) In a diagram show the diurnal circles of stars on the celestial sphere as seen from the North pole.

2. (a) How do you estimate magnetic field at solar surface? What is butterfly pattern and how does it form? 2+(1+1)

(b) Find the transformation relation between equatorial and horizontal system. 3

(c) The coordinate of star Arcturus are $\alpha$ = 14 h 15 min, $\delta = 19^\circ 1'$. Find the sidereal time at the moment Arcturus rises in Boston whose latitude is $42^\circ 19'$. 3

3. (a) What is differential rotation? Derive Oort's formula related to differential rotation of milky way. 1+3

(b) What are the inferences drawn by Jan H. Oort by his derivation about the Milky way galactic rotation? 1

(c) If the Oort's constants; $A$ = 15 km/s/kpc and $B$ = –10 km/s/kpc, what is the value of angular velocity of the Sun? 2

(d) Explain the important branches in the HR diagram. 3

4. (a) What are the special features of Cepheid Variables? How are these used to measure distance? 1+2

(b) The magnitudes of the components of a binary star are 1 and 2 respectively. What will be the total magnitude of the system? 3

(c) Why do you get continuous band in solar spectra? 2

(d) Why is the Newton's theory of gravity not consistent with special theory of relativity? 2

5. (a) Describe the physical environment and processes to obtain the emission line spectra and absorption line spectra from the stars. 4

(b) By which procedure the Corona region of Solar atmosphere has maintained a high temperature? 2

(c) Draw mass-radius graph for white dwarf stars and discuss the significance of Chandrasekhar Mass Limit. 4

**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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