U.G. 5th Semester Examination-2020

PHYSICS

[HONOURS]

Discipline Specific Elective (DSE)

Course Code : PHY-H-DSE-T-02

(Astronomy and Astrophysics)

Full Marks : 60 Time : $2\frac{1}{2}$ Hours

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

1. Answer any **ten** questions from the following: 2×10=20

a) Define parsec (pc)? How it is related to astronomical unit (AU)?

b) How many kilometres are there in a light- year?

c) What is meant by Reflecting and Refracting Telescope?

d) Define Celestial Pole and Celestial Equator.

e) Imagine an object is travelling around the sun. What would be the orbital period of the object if its orbit has a semi major axis of 50 AU?

f) The parallax of our nearest star Proxima Centauri is 0.785". Find its distance in *parsecs* and light years.

g) How many times brighter or fainter would a star appear if it were moved to i) twice its present distance, ii) half its present distance.

h) Two stars have the same size and are the same distance from us. Star A has a surface temperature of 6000K, and star B has a surface temperature of 12000K. How much more luminous is star B compared to star A?

i) What is H- R (Hertzsprung–Russell) diagram in the study of stellar evolution? Explain.

j) What is meant by solar time?

k) Discuss the difference between "Thermodynamic equilibrium" and "Local Thermodynamic equilibrium".

l) Define "rotation curve" of a spiral galaxy.

m) What is the present- day temperature of cosmic background radiation?

n) What is the *Schwarzschild radius* of an object? Why this is also called the "event horizon"?

o) What do you mean by *differential galactic rotation*?

2. Answer any **four** questions. 5×4=20

a) Explain the difference between the Solar day and Sidereal day? What are the advantages and disadvantages of apparent solar time? 3+2

b) Discuss Hubble's morphological classification of Galaxies. 5

c) What is meant by luminosity of a star? Present the relationship between the luminosity and the absolute magnitude of a star. 2+3

d) Compare the advantages and disadvantages of Reflecting and Refracting Telescopes. 5

e) Sketch an H- R diagram. Label the axes. Show where white dwarfs, the Sun, and main sequence stars are found. 5

f) Define Jeans critical wavelength λ_J and Jeans mass M_J in the case of star formation as a result of gravitational instability. Derive expressions for above quantities. 2+3

3. Answer any **two** questions. 10×2=20

a) Write down the de Vaucouleur's Law for variation of brightness of elliptical galaxies. Write a short note on Milky way Galaxy. 4+6

b) Write a short note on:

i) the11-*year solar cycle*,

ii) Solar Corona. 5+5

c) i) A distant galaxy has a red shift $z = \frac{\Delta\lambda}{\lambda}$ of 0.2. According to Hubble's Law, how far away was the galaxy when the light was

emitted if the Hubble constant is *72km/s/Mpc*.

ii) Write down the Hubble's Law for expanding Universe and define Hubble constant.

iii) What are the basic equilibrium conditions that must be satisfied by a stable stellar structure? 3+4+3

d) i) Explain the terms like "gravitational red shift" and "cosmological red shift".

ii) Write down the Friedman Equation for Flat FRW model and then get the solution for matter dominated universe. (2+2)+(2+4)

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