MANIPAL ACADEMY of HIGHER EDUCATION
(Institution of Eminence Deemed to be University)

Reg. No.										

DEPARTMENT OF SCIENCES
III SEMESTER M.Sc. (PHYSICS)
END SEMESTER MAKEUP EXAMINATIONS, DECEMBER 2023
PHY6051: FUNDAMENTALS OF ASTRONOMY AND ASTROPHYSICS (OPEN ELECTIVE)
(CHOICE BASED CREDIT SYSTEM - 2020)

Time: 3 Hours | Date: 27-12-2023 | MAX. MARKS: 50

Note (i) Answer ALL questions (ii) Draw diagrams, and write equations wherever necessary

Useful data:

- 1 Light year = 9.461×10^{12} km
- 1 AU = 1.496×10^{8} km = 1.581×10^{-5} ly
- 1 parsec = 2.06×10^{5} AU = 3.26 light years
- Stephan-Boltzmann constant = 5.67×10^{-8} $Wm^{-2}K^{-4}$
- Wien's constant = 2.9×10^{6} nmK
- Radius of Sun = 696000 km
- Mass of Sun = 2×10^{30} kg
- The average density of Sun = 1410 kgm^{-3}
- Luminosity of Sun = 3.846×10^{26} W
- $G = 6.674 \times 10^{-11}$ Nm^2/kg^2
- $k = 1.381 \times 10^{-23} J/K$
- Mass of Hydrogen atom $= 1.67 \times 10^{-27}$ kg
- Mass of Electron = 9.11×10^{-31} kg
- Planck's constant = 6.626×10^{-34} Js

Q. No.		Marks	CO	BL
1A	Describe the internal structure of Sun with a neat diagram. Explain the granulation of the photosphere	5	1	2
1B	The radius of a star is 1.5 times that of Sun. If its surface temperature is 9500 K, absolute and apparent magnitudes are +1.4 and -1.5 respectively, find (a) its distance from Earth in light years, (b) its luminosity and (c) stellar parallax produced by the star in arc seconds	3	1	3
1C	Explain how the radial velocity of a star can be determined from stellar spectra	2	1	2
2A	Explain how the energy is produced in stars through p-p chain, CNO cycle and triple alpha process	5	1	2
2B	A neutron star has 1.8 times the solar mass and a radius of about 13 km. If the angular speed of the neutron star is about 2×10^{9} times than of Sun, what is the angular momentum of the neutron star in terms of solar angular momentum?	3	1	3
2C	Explain the cosmological principle.	2	2	2
3A	Explain the classification of elliptical and spiral galaxies	3	2	2
3B	Describe the origin of dark matter hypothesis	2	2	2
3C	Describe the design and operation of Newtonian, Cassegrain and Coude type of telescopes with neat diagrams	5	1	2
4A	Why a typical white dwarf has very low opacity to radiation? Explain	3	1	2
4B	How Hubble's law and cosmic background radiation support the big bang theory? Explain	3	2	2
4C	Describe the formation of type I & type II supernovae	4	1	2
5A	Explain the dominant mechanisms of heat transfer in stars	3	1	2
5B	Obtain an expression for electron degeneracy pressure in a white dwarf	4	1	2
5C	Show that the fractional change in the period of a neutron star is equal to twice the fractional change in its radius	3	1	2

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