MANIPAL ACADEMY of HIGHER EDUCATION
(Deemed to be University under Section 3 of the UGC Act, 1956)

Reg. No.										

DEPARTMENT OF SCIENCES, III SEMESTER M.Sc
END SEMESTER EXAMINATION, NOVEMBER 2019
FUNDAMENTALS OF ASTRONOMY AND ASTROPHYSICS (OPEN ELECTIVE) [PHY5051]
(REVISED CREDIT SYSTEM : 2017)

Time: 3 Hours MAX. MARKS: 50

Note: (i) Answer all the questions

(ii) Useful data: (a) σ = 5.67 X 10^{-8} $Wm^{-2}K^{-4}$ (b) k_B=1.381 X 10^{-23} J/K (c) G = 6.674 X 10^{-11} Nm^2/kg^2
(d) h =6.626 X 10^{-34} Js (f) Proton mass = 1.67 X 10^{-27} kg (g) Electron mass = 9.11 X 10^{-31} kg
(h) Mass of H atom = 1.67 X 10^{-27} kg (Any missing data can be suitably assumed)

(iii) Draw neat diagrams wherever necessary

1(a)	A star which is at a distance of 1.3pc from Earth has an apparent magnitude of 11.13 and hence not visible to naked eye. (a) What is its absolute magnitude? (b) How far this star should be from Earth in order to be visible to naked eye? (Take apparent magnitude limit of human eyes as +6)	3 M
1(b)	Describe the production of energy in stars by p-p chain, CNO cycle and triple alpha process	4 M
1(c)	Show that the rate at which a PULSAR is slowing down (rate of change of period dP/dt), is directly related to the rate of energy loss	3 M
2(a)	A star with surface temperature of $5800\ K$ is releasing $3.95 \times 10^{26}\ J$ of energy per second. Find its radius in km.	1 M
2(b)	Derive the equations for Jeans mass and Jeans length.	5 M
2(c)	Obtain an equation for electron degeneracy pressure (neglect relativistic effects)	4 M
3(a)	Explain Hubble's law	2 M
3(b)	Describe the structure and classification of elliptical and spiral galaxies	4 M
3(c)	Describe the design of three major types of reflection telescopes with neat diagrams	4 M
4(a)	Explain the reason for the granulation on the photosphere of Sun	2 M
4(b)	Explain the following: (a) cosmic background radiation, (b) Planck epoch, (c) Era of recombination, (d) cosmological principle	4 M
4(c)	How the concept of dark matter originated? Describe the role played by dark matter in the galaxies	4 M
5(a)	What are spectroscopic binary systems? Explain how they are identified	3 M
5(b)	Estimate the degeneracy pressure in a white dwarf of density $1 \times 10^9 kg/m^3$, and Z/A = 0.5. (neglect relativistic effects)	2 M
5(c)	Briefly describe the evolution of high mass stars into a supergiant, a neutron star and a stellar black hole.	5 M