MANIPAL ACADEMY of HIGHER EDUCATION

Reg. No.										

DEPARTMENT OF SCIENCES, III SEMESTER M.Sc
END SEMESTER EXAMINATIONS, NOVEMBER 2018
PHY5051: FUNDAMENTALS OF ASTRONOMY AND ASTROPHYSICS (OPEN ELECTIVE)
(REVISED CREDIT SYSTEM)

Time: 3 Hours MAX. MARKS: 50

Note: (i) Answer all the questions

(ii) Any missing data can be suitably assumed

1(a)	**The apparent magnitudes of Sun and full moon are -26.7 and -12.6 respectively. How far away, from Earth, the Sun should be so that it appears just as bright as full moon? (Given : 1 AU $\cong 150 \times 10^6$ km)**	**2 M**
1(b)	**Describe how energy is produced in stars by p-p chain and CNO cycle**	**4 M**
1(c)	**Obtain an equation for electron degeneracy pressure (neglect relativistic effects)**	**4 M**
2(a)	**What is chromatic aberration in telescopes? How it can be reduced?**	**2 M**
2(b)	**Derive the equations for Jeans mass and Jeans length. Find the Jeans length and mass in a cloud with 10^5 H atoms per cubic centimetre and a temperature of 50 K (Given: Mass of H atom: 1.67 X 10^{-27} kg, G: 6.674 X 10^{-11} Nm^2/kg^2 k=1.381 X 10^{-23} J/K)**	**5 M**
2(c)	**Consider a rotating neutron star with a mass equal to 2 times solar mass and a radius *R*=15 km, a period *P*= 0.1 s, and a rate of change of the period $dP/dt = 3 \times 10^{-6}\ s/year$ Find (a) the kinetic energy, (b) the rate at which the kinetic energy is decreasing, and (c) the lifetime of the pulsar if it loses energy at this rate. (Given: $Solar\ Mass = 2 \times 10^{30}\ kg$)**	**3 M**
3(a)	**Describe the classification system of elliptical and spiral galaxies**	**3 M**
3(b)	**Describe the following: (a) Hubble's law, (b) Planck epoch, (c) Era of recombination, (d) cosmic background radiation and (e) Cosmological principle**	**5 M**
3(c)	**Describe the origin of dark matter hypothesis.**	**2 M**
4(a)	**Find the difference between the acceleration of gravity at the feet and head of an imaginary astronaut (height 180 cm) just outside a black hole of mass equal to 3 times solar mass (Given: Solar mass: 2 x 10^{30} kg, G = 6.674 X 10^{-11} Nm^2/kg^2)**	**2 M**
4(b)	**Describe the differences between the evolution of low initial mass and high initial mass stars**	**4 M**
4(c)	**What is a PULSAR? How they can be used as probes of interstellar space?**	**4 M**
5(a)	**What is Schwarzschild radius? Find the Schwarzschild radius of Sun (Mass = $2 \times 10^{30}\ kg$)**	**2 M**
5(b)	**Describe the inner structure of sun with the help of a neat diagram**	**3 M**
5(c)	**Describe the structure of Newtonian, Cassegrain and Coude type telescopes with the help of neat diagrams**	**5 M**