

DEPARTMENT OF SCIENCES IV SEMESTER M.Sc (PHYSICS) - END SEM. EXAMINATIONS, APRIL 2018

Subject : PHY 704 - RELATIVITY AND ASTROPHYSICS (REVISED CREDIT SYSTEM)

Time: 3 Hours MAX. MARKS		(S: 50
Note: (i) Answer any FIVE FULL questions		
(ii) Draw diagrams, and write equations wherever necessary		
1 (a) 1 (b)	Obtain Lorentz transformation equations for space and time coordinates from Einstein's postulates Prove that four acceleration and four velocity are mutually orthogonal	5 M 3 M
I (c)	The microwave hydrogen lines with wavelength 22.5cm emitted from two galaxies appear to be 25 cm and 25.5 cm respectively. Find the relative speeds of the galaxies with respect to each other	2 M
2 (a) 2 (b)	Show that geodesic of a spherical shaped space is a great circle Obtain Riemann, Ricci curvature tensors and curvature scalar for a spherical surface	5 M 5 M
3 (a)	Obtain expressions for Jeans length and Jeans mass for a spherically symmetric cloud	5 M
3 (b) 3 (c)	Differentiate between the type I and type II supernova Explain different regions of the H-R diagram	2 M 3 M
4 (a) 4 (b) 4 (c)	What is a PULSAR? Explain Explain the energy production in a star by CNO cycle Find the Jeans length and mass in a cloud with 10^5 Hydrogen atoms per cubic cm and a temperature of 50 K (Given: Mass of H atom: 1.67 X 10^{-27} kg, G: $6.674 \times 10^{-11} \text{ Nm}^2/\text{kg}^2 \text{ k}=1.381 \times 10^{-23} \text{ J/K}$)	3 M 4 M 3 M
5 (a) 5 (b)	Explain the classification and sub-classifications of galaxies Explain Planck epoch, era of recombination and origin of cosmic background radiation	3 M 5 M
5 (c)	Explain Hubble's law	2 M
6 (a) 6 (b) 6 (c)	Prove that geodesic is an auto-parallel curve Explain apparent magnitude, absolute magnitude and luminosity of a star Discuss the Schwarzschild solution for Einstein's field equation ****	5 M 3 M 2 M