Dr. TM

Reg No										

Manipal University, Manipal

DEPARTMENT OF SCIENCES

4th sem M Sc (Phy) End Sem Examination- May 2016

PHY 704 - Relativity and Astrophysics

Time: 3hour **Max. Marks:** 50

Answer any FIVE full questions

1. A) Obtain an expression for the relativistic kinetic energy of a particle. Show that it reduces to classical expression for low speeds. **5 marks**
   B) Obtain an expression for the relativistic Doppler effect. How it is different from classical Doppler effect for sound waves? **5 marks**

2. A) Two motor cyclists are racing at relativistic speeds along perpendicular directions with velocities of 0.75c and 0.90c with respect to a stationary observer. Calculate their relative velocity. **5 marks**
   B) Write a note on Tensors. **5 marks**

3. A) Describe Ötvos experiment and explain the experimental outcome. **5 marks**
   B) Explain gravitational red shift. **5 marks**

4. A) Deduce an expression for Schwarzschild line element and hence arrive at its solution. **5 marks**
   B) What is a geodesic ? Deduce the equation for the same. **5 marks**

5. A) Explain the statistical parallax method of determining the distance of group of stars. **6 marks**
   B) What is a parsec? Obtain its value in terms of meter and light year. **Given :** Mean Sun-Earth distance=$1.49597871 \times 10^{11}$ m. **4 marks**

6. A) Give an account of (mathematical details are not necessary) pre-main sequence evolution of stars. **6 marks**
   B) Calculate the time taken by the light to travel to Earth from the nearest star Proxima Centauri which subtends a parallax angle of 0.785″. Given: Mean Sun-Earth distance = 1.496×10^{11} m. **4 marks.**

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