b) Why Einstein introduced Cosmological constant in his field equation?

7. a) Derive cosmological redshift from FRW metric.

b) Rewrite de Sitter metric in Schwarzschild coordinates.

M. Sc. Mathematics Examination, 2022

(2nd Year, 2nd Semester)

General Theory of Relativity and Cosmology - II

Paper – 4.4 (B-2.17)

Time : Two hours Full Marks : 50

Answer ***any five*** questions. 10×5=50

1. Find Schwarzschild interior solution when pressure is same in everywhere. Explain some features of this spacetime.

2. Define Isotropic co-ordinate system. Rewrite the Einstein line element for a static universe

$$ds^2 = dt^2 - \frac{dr^2}{1-\frac{r^2}{R^2}} - r^2\left(d\theta^2 + \sin^2\theta\, d\phi^2\right),$$

in isotropic co-ordinate system.

3. Describe a mathematical model of White Dwarfs.

4. a) What is Olber paradox? How the expanding Universe hypothesis resolves it?

b) Find Newtonian limit of the TOV equation.

5. Discuss Openheimer-Snyder non static dust model for gravitational collapse.

6. a) Discuss the stable circular orbit in Schwarzschild spacetime.