

M.Sc.- II (Mathematics) New CBCS Pattern Semester-IV
PSCMTH19B - Optional : Cosmology

P. Pages : 2

Time : Three Hours



GUG/W/23/13771

Max. Marks : 100

- Notes : 1. Solve all the **five** questions.
2. Each question carry equal marks.

UNIT – I

1. a) Show that the geometry of the de sitter universe is that of the surface of a sphere embedded in five dimensional Euclidean space. **10**
b) Discuss the geometry of Einstein universe. **10**

OR

- c) Explain the Weyl hypothesis. **10**
d) Derive the equation of path of particle for motion of test particles. **10**

UNIT – II

2. a) Derive the Robertson- Walker line element. **10**
b) Discuss the properties of the R-W metric. **10**

OR

- c) Explain the red shift by considering the R-W model. **10**
d) Show that the particle does not experience gravitational force for the motion of particles & light rays in R-W model. **10**

UNIT – III

3. a) Derive the fundamental equations of dynamical cosmology. **10**
b) Prove that matter dominated era of the universe is governed by the equation **10**

$$\left(\frac{\dot{R}}{R_0}\right)^2 = H_0^2 \left[1 - 2q_0 + 2q_0 \frac{R_0}{R}\right].$$

OR

- c) Explain the Friedmann model $K=1$, the closed model. **10**
d) Discuss the steady state cosmology. **10**

UNIT – IV

4. a) Obtain the parametric equation of the light paths. **10**
- b) Explain one reason for measurements of luminosity distance, angular diameter distance & red shift. **10**

OR

- c) Obtain the relation $d_r = R(t_0) \frac{r_1}{(1 - Kr_1^2)^{\frac{1}{2}}}$. **10**
- d) Define the luminosity distance d_L of a light source & explain the quantities used in the calculation of angular diameters & proper motions. **10**
5. a) Define the Einstein universe. **5**
- b) Explain shortly the Hubble's law. **5**
- c) Show that $R^3 \propto t^2$. **5**
- d) Define absolute bolometric magnitude & the trigonometric parallax. **5**
