Roll No. .....

D–3762

M. A./M. Sc. (Final) EXAMINATION, 2020

MATHEMATICS

(Optional)

Paper Fifth (*i*)

(General Relativity and Cosmology)

Time : Three Hours] [*Maximum Marks : 100*

Note : Attempt any *two* parts from each Unit. All questions carry equal marks.

Unit—I

1. (a) Define Contraction of Tensors. Show that on contraction, the order of a mixed tensor reduces by two.

   (b) State and prove quotient law in tensor.

   (c) Define intrinsic derivatives and obtain differential equation for the geodesic.

Unit—II

2. (a) Write short notes on the following :

   (i) Principle of covariance

   (ii) Principle of equivalence

   (b) Derive Bianchi Identity and contract it to find Einstein's tensor.

   (c) Find Newtonian approximation of equation of motion.

Unit—III

3. (a) Obtain counterpart of Kepler's equation of planetary motion in general relativity.

   (b) Derive Schwarzchild's external solution for gravitational field of point mass.

   (c) Discuss bending of light rays when it passes through heavy star.

Unit—IV

4. (a) Find angular size of a distant star in term of red shift with the help of Robertson Walker metric.

   (b) Write an essay on Mach's principle.

   (c) Describe cosmological model of de-Sitter with properties.

Unit—V

5. (a) Find present age of universe in closed FRW space time.

   (b) Find out the steady state cosmology of universe.

   (c) Discuss Eddington-Lemaitre cosmological model with cosmological constant Λ .