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**F - 3862****M.A./M. Sc. (Final) Examination, 2022****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) State and prove quotient law in tensor.
- (B) Define contravariant and covariant vectors giving examples and Laws.
- (C) Express any second order tensor as a sum of symmetric and a skew symmetric tensor.

**Unit - II**

2. (A) Explain principle of covariance and principle of equivalence.
- (B) Derive Einstein's field equation of Gravitation.
- (C) Show that Newtonian equation of motion as an approximation of geodesic equation.

**Unit - III**

3. (A) Discuss in detail about Schwarzschild internal solution.
- (B) Derive Einstein Maxwell equation by expressing Maxwell equation of electrodynamics into Tensor form.
- (C) Derive Energy momentum tensor for perfect fluid.

**Unit - IV**

4. (A) Show that Einstein Universe is not an Einstein space whereas de - sitter's universe is.
- (B) Explain Mach's principle.
- (C) Explain Hubble's Law.

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**Unit - V**

5. (A) Discuss perfect cosmological principle and steady state cosmology.
- (B) Discuss Eddington - Lemaitre cosmological model with cosmological constant  $\Lambda$ .
- (C) Describe Einstein - Desitter model of Universe.