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M. Sc. (Final) Examination, 2016

MATHEMATICS

Paper–III

(Relativity & Cosmology)

Time : Three Hours
Maximum Marks : 100

PART - A (खण्ड-अ)   [Marks : 20

Answer all questions (50 words each).

All questions carry equal marks.

सभी प्रश्न अनिवार्य हैं। प्रत्येक प्रश्न का उत्तर पचास शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

PART - B (खण्ड-ब)   [Marks : 50

Answer *five* questions (250 words each).

Selecting *one* from each unit. All questions carry equal marks.

प्रत्येक इकाई से **एक-एक** प्रश्न चुनते हुए, कुल **पाँच** प्रश्न कीजिए।

प्रत्येक प्रश्न का उत्तर 250 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

PART - C (खण्ड-स)   [Marks : 30

Answer any *two* questions (300 words each).

All questions carry equal marks.

कोई **दो** प्रश्न कीजिए। प्रत्येक प्रश्न का उत्तर 300 शब्दों से अधिक न हो।

सभी प्रश्नों के अंक समान हैं।

P.T.O.

PART - A

UNIT - I

1. (i) Write the symmetric properties of covariant curvature tensor.

(ii) Define Null Geodesics.

UNIT - II

(iii) State principle of equivalence.

(iv) Write the formula of energy momentum tensor for perfect fluid.

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UNIT - III

(v) Explain mach principle.

(vi) Name the three crucial test in general relativity.

UNIT - IV

(vii) Define cosmology.

(viii) WRite the main difference between Einstein and De-

sitter universe.

UNIT - V

(ix) Write Maxwell equation in tensor form.

(x) Explain electromagnetism in general relativity.

PART - B

UNIT - I

2. (a) State & prove Bianchi Identities.

(b) Find the number of independent components of C_{hijk}.

3. Obtain the equations of the geodesics for the metric :

$$ds^2 = -dx^2 - dy^2 - dz^2 + f(x, y, z)\, dt^2$$

UNIT - II

4. (a) Write short note on principle of covariance.

(b) Explain the condition of lat space time.

5. Obtain the expression for Newtonian approximation of equation of motion.

UNIT - III

6. Discuss the leending of light says in a gravitational field.

7. Explain the gravitational red shift of spectral lines.

UNIT - IV

8. Find condition for static cosmological models in cas & of Einstein universe and De-sitter universe.

9. Show that Einstein universe is no an Einstein space where as de-sitter universe is an Einstein space.

UNIT - V

10. Derive Einstein Maxwell equation from action principle.

11. Explain electromagnetism in general relativity.

PART - C

UNIT - I

12. Obtain the condition for a coordinate system x^i to be geodesic coordinate system with the pole P_0.

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UNIT - II

13. Deduce Schwarzchild's interior solution for gravitational field.

UNIT - III

14. Explain & derive the formula for advancement of perihelion

of mercury.

UNIT - IV

15. Derive the expression for Robertson Walker metric.

UNIT - V

16. Obtain Reissner-Nord storm solution for charged spherically symmetric particle at rest at the origin.