

Roll No :

Total No. of Questions : 11]

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ASP-647

M.A./M.Sc. (Final) Examination, 2021

MATHEMATICS

Paper -Opt.-V

(Differential Geometry of Manifolds)

Time : 1½ Hours]

[Maximum Marks : 100

Section-A

(Marks : 2 × 10 = 20)

Note :- Answer all *ten* questions (Answer limit 50 words). Each question carries 2 marks.

(खण्ड-अ)

(अंक : 2 × 10 = 20)

नोट :- सभी दस प्रश्नों के उत्तर दीजिए (उत्तर-सीमा 50 शब्द)। प्रत्येक प्रश्न 2 अंक का है।

Section-B

(Marks : 4 × 5 = 20)

Note :- Answer all *five* questions. Each question has internal choice (Answer limit 200 words). Each question carries 4 marks.

(खण्ड-ब)

(अंक : 4 × 5 = 20)

नोट :- सभी पाँच प्रश्नों के उत्तर दीजिए। प्रत्येक प्रश्न में विकल्प का चयन कीजिए (उत्तर-सीमा 200 शब्द)। प्रत्येक प्रश्न 4 अंक का है।

Section-C

(Marks : 20 × 3 = 60)

Note :- Answer any *three* questions out of five (Answer limit 500 words). Each question carries 20 marks.

(खण्ड-स)

(अंक : 20 × 3 = 60)

नोट :- पाँच में से किन्हीं तीन प्रश्नों के उत्तर दीजिए (उत्तर-सीमा 500 शब्द)। प्रत्येक प्रश्न 20 अंक का है।

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(1)

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Section–A

2 each

1. (i) Define differentiable manifolds.
- (ii) Define Jacobian map.
- (iii) Define exponential maps.
- (iv) Define topological groups.
- (v) Write principle of fibre bundle.
- (vi) Define Riemannian manifolds.
- (vii) Define Curvature tensor.
- (viii) Define sectional curvature.
- (ix) Define Hyper surfaces.
- (x) Define line of curvature.

Section–B

4 each

2. Explain Tangent spaces of differential manifolds.

Or

Explain lie derivative.

3. Derive product of two lie groups.

Or

Derive lie transformations groups.

4. Explain associated fibre bundle.

Or

Explain Riemannian connection.

5. State and prove Schur's theorem.

Or

Explain conformal curvature tensor.

6. Derive Weingarten equations.

Or

Explain contravariant and covariant almost analytic vector fields.

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Section–C

20 each

7. Write notes on the following :
 - (i) One parameter group of transformations.
 - (ii) Immersion and embeddings of differential manifolds.
8. Explain Bundle homomorphism and Riemannian manifolds.
9. Describe lie transformations groups and general linear groups.
10. Explain Geodesics in a Riemannian manifolds.
11. Derive generalised Gauss and Mainardi-Codazzi equation.