A–1034

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MT-504

M.A./M.Sc. Mathematics (MAMT/MSCMT)

Differential Geometry and Tensor-I

Examination, 2026 (Feb.)

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions 2×19=38

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. Find the inflexional tangent at (x, y, z) on the surface $y^2z = 4ax$.

2. Prove that on a given surface, a family of curves and their orthogonal trajectories can always be chosen as parametric curves.

3. Prove that the metric of a surface is invariant under parametric transformation.

4. Prove that the generators of a developable surface are tangents to curve.

5. Find the equation of the osculating sphere and osculating circle at (1, 2, 3) on the curve :

$$x = 2t + 1,\ y = 3t^2 + 2,\ z = 4t^3 + 3$$

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Show that the tangent at any point of the curve whose equations are $x = 3\ t,\ y = 3t^2\ z = 2t^3$ make a constant angle with line $y = z - x = 0$.

2. Prove that the curvature and torsion of either associated Bertrand curves are connected by a liner relation.

3. Prove that each characteristic touches the edge of regression.

4. Define each of the following

   (i) Osculating Plane

   (ii) Principal Normal

   (iii) Binormal

   (iv) Inflexional tangents

5. Prove that the points of the surface $x\,y\,z - a(yz + zx + xy) = 0$ at which is the Indicatrix is a rectangular hyperbola, lie on the cone $x^4(y + z) + y^4(z + x) + z^4(x + y) = 0$.

6. Prove that the envelope of a family of surfaces touches each member of the family at all points of its characteristic.

7. Find the equation to the edge of regression of the developable $y = xt - t^3$, $z = t^3y - t^6$.

8. Find the evolutes of the circular helix $x = a \cos \theta$, $y = a \sin \theta$, $z = a\,\theta \tan \alpha$.

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