A–0708

Total Pages : 3 **Roll No. ....**

MT-504

MA/MSC Mathematics (MAMT/MSCMT)

(Differential Geometry and Tensor-I)

Examination, June 2025

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 Ssections 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. Define osculating plane. Find the equation of osculating plane in terms of parameter s.

2. Define evolute. Find curvature and torsion of the evolute.

3. Find the relation between three fundamental forms.

4. Find the curvature of a normal section of right helicoid

$$x = u \cos \phi,\ y = u \sin \phi,\ z = c\phi$$

5. State and prove existence theorem on space curve.

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. Find the equation to the developable surface which has the curve $x = 6t$, $y = 3t$, $z = 2t^3$ for its edge of regression.

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

3. Prove that the necessary and sufficient condition that a given curve be a plane curve is that $\tau = 0$ at all points of the curve.

4. Find the involute of the circular helix given by :

$$x = a \cos\theta,\ y = a \sin\theta,\ z = a\theta \tan\alpha$$

5. Find and classify the singular points of the surface :

$$xyz - a^2 (x + y + z) + 2a^3 = 0$$

6. Prove that on the surface $z = f(x, y)$ torsion of the asymptotic lines are :

$$\pm \frac{\sqrt{(s^2 - rt)}}{(1 + p^2 + q^2)}$$

7. Define :

(i) Inflexional tangents

(ii) Osculating circle

8. Prove that the indicatrix at a point of a surface $z = f(x, y)$ is a rectangular hyperbola if :

$$(1 + p^2)t + (1 + q^2)r - 2pqs = 0$$

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