P-135

Roll No. ....

MT-504

Differential Geometry and Tensor-I

MA/MSC Mathematics (MAMT/MSCMT)

1st Semester Examination, 2023 (June)

Time : 2 Hours]   **[Max. Marks : 35**

Note : This paper is of Thirty Five (35) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION–A
(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nine and Half (9½) marks each. Learners are required to answer any Two (02) questions only.

$$(2×9½=19)$$

1. Find the equation to the tangent at the point u on circular helix

$$x = a \cos u, \, y = a \sin u, \, z = cu.$$

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2. Find the condition that a curve and a surface have a contact of *n*th order.

3. Find the equation of osculating plane.

4. Find the curvature and torsion of the cubic curve given by
$\vec{r} = (u, u^2, u^3)$

5. State and prove Meunier's theorem.

SECTION–B
(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Four (04) marks each. Learners are required to answer any Four (04) questions only.　　(4×4=16)

1. Find the length of the circular helix

$\vec{r}(u) = a \cos u\,\hat{i} + a \sin uj + cu\hat{k}$, $-\infty < u < \infty$ from (a, o, o) to $(a, o, 2\pi c)$.

2. Define curvature, torsion and screw curvature of a space curve.

3. Show that serret-frenet formula can be written in the form $t' = w \times t$, $n' = w \times n.b' = w \times b$ and find *w*.

4. Prove that the locus of the centre of curvature is an evolute only when the curve is plane.

5. Prove that torsion at corresponding points of two Bertnard curve have the same sign

6. Find a unit normal vector to the surface $2xz^2 - 3xy - 4x = 7$ at the point $(1, -1, 2)$.

7. Discuss orthogonal trajectories with suitable examples.

8. Find the equation of edge of regression of the envelope.

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