K-437

Total Pages : 3 Roll No. ....

MT-504

Differential Geometry and Tensor-I

MA/MSC Mathematics (MAMT/MSCMT)

1st Semester Examination, 2023 (Dec.)

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. 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)

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 curvature of a normal section of the right helicoids

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

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

3. Define Bertrand curve. Show that the curvature and torsion of either associate Bertrand curves are connected by a linear relation.

4. State and prove Serret-Frenet formulae.

5. Find the angle between two tangential directions on the surface.

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 conditions for two asymptotic directions at a point to be real and district, coincident or imaginary.

2. Define the following :

   (a) Gaussian curvature.

   (b) Minimal surface.

3. Define orthogonal trajectory. Find the differential equation of the orthogonal trajectory.

4. Examine whether the surface $z = y \sin x$ is developable.

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

6. Find the involute of a circular helix given by $x = a \cos \theta$, $y = a \sin \theta$, $z = a\, \theta \tan \alpha$.

7. Prove that the principal normals at consecutive points of a curve do not intersect unless $\tau = 0$.

8. Find the plane that has three point contact at the origin with the curve $x = t^4 - 1$, $y = t^3 - 1$, $z = t^2 - 1$.