Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐ **Total No. of Pages : 02**

Total No. of Questions : 07

M.Sc.(Mathematics) (Sem.–4)

DIFFERENTIAL GEOMETRY

Subject Code : MSM-401-18

M.Code : 77870

Date of Examination : 01-07-22

Time : 3 Hrs. **Max. Marks : 70**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of FIVE questions carrying TWO marks each.**
2. **SECTION - B &C have THREE questions each.**
3. **Attempt any FOUR questions from SECTION B& C carrying FIFTEEN marks each.**
4. **Select atleast TWO questions from SECTION - B &Ceach.**

SECTION-A

1. Define briefly :

a) Calculate the curvature and torsion of the cubic curve given by r = (u, u^2, u^3).

b) Show that principal normals at consecutive points do not intersect unless $\tau = 0$.

c) Calculate the fundamental magnitudes for the right helicoids given by

$$x=u \cos v,\ y = u \sin v,\ z = cv.$$

d. Prove that on the surface of revolution $x=u \cos v$, $y = u \sin v$, $z = f(u)$, the asymptotic lines are $f_{11} du^2 + uf_1 dv^2 = 0$. Also, find their torsions.

e. Prove that if a geodesic is either a plane curve or a line of curvature, it is both.

SECTION-B

2. State and prove Serret-Frenet Formulae.

3. Define First Fundamental Form and their Geometrical interpretation, also prove invariance property.

4. Prove that Envelope of a family of surfaces touches each member of the family, at all points of its characteristic. Also, find the equation of the edge of regression of the envelope.

SECTION-C

5. State and prove Mainardi- Codazzi Equations.

6. To prove that the normal to any surface at consecutive points of one of its line of curvature intersect. Conversely, if the normals at two consecutive points of a curve drawn on a surface intersect, the curve is a line of curvature.

7. State and Prove Gauss - Bonnet Theorem.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student