Roll No…………………….. **Total No. of Printed Pages: [01]**

Total No. of Questions: [09]

B. Sc (Hons Math) (Semester – 5th)

DIFFERENTIAL GEOMETRY

Subject Code: BMATS1503

Paper ID: [19131222]

Time: 03 Hours **Maximum Marks: 60**

Instruction for candidates:

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

Section – A **(2 marks each)**

Q1. Attempt the following:

a. Find the equation of tangent plane and normal of the surface $z = x^2 + y^2$ at the point (1,-1,2).

b. Calculate first fundamental magnitudes for the right helicoids given by $x = u \cos\alpha$, $y = u \sin\alpha$, $z = c\alpha$

c. Define curvilinear equation of the curve on the surface.

d. Define Geodesics and give its equivalent definations.

e. The torsion of a Geodesics vanishes in a Principal Directions.

f. The Geodesics curvature vector of any curve is orthogonal to the curve.

g. Define Principal normal and Bi-normal.

h. Calculate the arc length of a cycloid a(t-sint , 1-cost) : where t is angle through which the circle has rotated

i. Define involute and Evolute.

j. Explain Osculating Sphere.

Section – B **(5 marks each)**

Q2. State and Prove Gauss Bonnet theorem.

Q3. The necessary and sufficient condition that on the general surface , the curve v= c be geodesic is EE2 + FE1 – 2EF1 = 0 when v = c for all values of u

Q4. The necessary and sufficient condition for the curve to be plane curve is $[\Upsilon', \Upsilon'', \Upsilon''']= 0$

Q5. Show that the curvature of the circle of radius R and centered at origin is the reciprocal of its radius..

Q6. Explain Geometric interpretation of 2nd fundamental form.

Section – C **(10 marks each)**

Q7. Derive Weingarten Equation.

Q8. State and prove Serret Frenet Formula.

Q9. Find the Curvature and Torsion of Evolute.