# C. ABDUL HAKEEM COLLEGE (AUTONOMOUS),
## MELVISHARAM - 632 509.
## SEMESTER EXAMINATIONS, NOVEMBER - 2018

**M.Sc., MATHEMATICS** **SEMESTER III**

**P15MMA303 – DIFFERENTIAL GEOMETRY**

Time: Three Hours Maximum: 75 Marks

SECTION - A (5 X 6 = 30 Marks)

Answer **ALL** Questions.

1. a) Prove that a necessary and sufficient condition for a curve to be a straight line is that $\mathcal{K} = 0$ at all points of the curve.

(Or)

b) Find the curvature and torsion of the circular helix $r = (a \cos u, a \sin u, bu)$.

2. a) Prove that the first fundamental form of a surface is positive definite quadratic form in dudv.

(Or)

b) On the paraboloid $x^2 - y^2 = z$, find the orthogonal trajectories of the section by the plane z = constant.

3. a) Prove that $ds^2 = du^2 + G(u,v)dv^2$.

(Or)

b) State and prove Normal property of Geodesics.

4. a) Prove that $\mathcal{K}_g = [N, r', r'']$.

(Or)

b) Prove that the total curvature of a geodesic triangle ABC on a surface is $A + B + C - \pi$.

5. a) State and prove Rodrigue's formula.



(Or)

b) If there is a surface of minimum area passing through a closed curve then it is necessarily a minimal surface.

SECTION - B (3 X 15 = 45 Marks)

Answer **ANY THREE** Questions.

6. State and Prove Fundamental Existence theorem for Space Curves.
7. Find the Surface of Revolution which is isometric with the region of right helicoids.
8. Derive the Geodesic Differential equation.
9. State and prove Minding theorem.
10. Prove that a necessary and sufficient condition that a curve on a surface be a line of curvature is that the surface normal's along the curve form a developable.

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