



THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)

Re-accredited (2nd Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

Backlog Arrear Examination, March 2021

PGM 4332

DIFFERENTIAL GEOMETRY

Time: 3Hours

Max: 75 Marks

ANSWER ANY FIVE QUESTIONS.

5X15=75

1. State and prove Serret-Frenet equations.
2. Prove that the position vector of any point on the surface of revolution generated by the curve $[g(u), 0, f(u)]$ in the XOZ plane is $r = [g(u) \cos v, g(u) \sin v, f(u)]$ where v is the angle of rotation about the z -axis.
3. Show that any curve $u = u(t), v = v(t)$ on a surface $r = r(u, v)$ is a geodesic if and only if the principal normal at every point on the curve is normal to the surface.
4. If κ_n is the normal curvature of a curve at a point on a surface, then $\kappa_n = \frac{Ldu^2 + 2Mdudv + Ndv^2}{Edu^2 + 2Fdudv + Gdv^2}$, where $L = N \cdot r_{11}, M = N \cdot r_{12}, N = N \cdot r_{22}$ and E, F, G are first fundamental coefficients.
5. Show that the only compact surfaces of class ≥ 2 for which every point is an umbilic are spheres.
6. State and prove existence theorem for space curves.
7. Prove that: a necessary and sufficient condition for a surface to be a developable is that its Gaussian curvature shall be zero.