



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

MAT 256

Max.Marks:75

Geometry-II

Duration:3hrs

Answer any FIVE Questions:

5×15=75

- (i) Prove that the value of a cross ratio remains unchanged when any two of the four elements are interchanged simultaneously with the other two elements.
(ii) State and Prove the fundamental theorem on projective planes.
- Prove that a projectivity with a fixed point is a perspectivity. Hence prove Pappus Theorem.
- State and Prove Desargue's Theorem.
- (i) Prove the dual of the axiom "If two triangles are perspective from a point, they are perspective from a line".
(ii) Prove that the Projective transformation forms a group.
- (i) Derive Serret-Frenet formulae.
(ii) Show that for the curve $x = a(3u - u^3)$, $y = 3au^2$, $z = a(3u + u^3)$, the curvature and torsion is $\frac{1}{3a(1+u^2)^2}$.
- (i) If the radius of spherical curvature is constant, prove that the curve either lies on the surface of a sphere or else has constant curvature.
(ii) Prove that the only curve whose curvature and torsion are both constant is the circular helix.
- (i) Show that the torsion of an involute is $\frac{\kappa\tau^2 - \kappa'\tau}{\kappa(\kappa^2 + \tau^2)(c-s)}$.
(ii) Prove that the ratio of the torsion of the evolute to its curvature is $-\tan(\psi + c)$.