SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN (AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
M.Sc. Appl.Maths - END SEMESTER EXAMINATIONS APRIL - 2024
SEMESTER - IV

20PAMCT4011 - Differential Geometry and Tensor Calculus

Total Duration : 2 Hrs. 30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

1. Give the equation of a circular helix and find the length of one complete turn.
2. Describe the Osculating sphere giving its centre of spherical curvature and radius of spherical curvature.
3. Explain how the anchor ring is generated and give the equation of the surface of revolution.
4. How is the Helicoid generated. Differentiate between the right helicoid and the general helicoid.
5. Find the orthogonal trajectories of the sections by the planes z = constant on the paraboloid $x^2 - y^2 = z$.
6. A particle is constrained to move on a smooth surface under no force except the normal reaction. Prove that its path is a geodesic.
7. Show that the sum of two tensors which have the same number of covariant and the same number of contravariant indices is again a tensor of the same type and rank as the given tensors.
8. Prove the quotient law of tensors.

Section C

I - Answer any **TWO** questions ($2 \times 10 = 20$ Marks)

9. Obtain the curvature and torsion of the curve of intersection of the 2 quadratic surfaces $ax^2 + by^2 + cz^2 = 1, a'x^2 + b'y^2 + c'z^2 = 1$.
10. State and prove the Fundamental existence theorem for space curves.
11. A helicoid is generated by the screw motion of a straight line skew to the axis. Find the curve coplanar with the axis which generates the same helicoid.

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12. If a transformation of coordinates T possesses an inverse T^{-1} and if J and K are the Jacobians of T and T^{-1} respectively then JK $= 1$.Validate this statement.

II - Compulsory question $(1 \times 10 = 10$ Marks)

13. Prove that the curves of the family $v2/u^2 = c$ are geodesics on a surface with metric $v^2du^2 - 2uvdudv + 2u^2dv^2\,(u > 0, v > 0)\cdot$

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