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D. K. M. COLLEGE FOR WOMEN (AUTONOMOUS), VELLORE-1
SEMESTER EXAMINATIONS
JUNE - 2022 21CPMA2D
DIFFERENTIAL GEOMETRY

Time: 3 Hours **Max. Marks: 75**

SECTION – A (5 x 6 = 30)

Answer ALL the questions.

1. *(a) State and prove Serret Frenet formula.*

(Or)

(b) Find curvature and torsion of $\vec{r} = (u, u^2, u^3)$.

2. *(a) Find the coefficient of the direction which makes an angle π/2 with direction whose coefficient of (m,n).*

(Or)

(b) Obtain the fundamental form of the sphere $\vec{r}$= (asinucosv, asinusinv, acosu) and show that the parametric curves are orthogonal.

3. *(a) Prove that, on the general surface, a necessary and sufficient condition that the curve v = C be a geodesic is EE2 + FE1 – 2EF1 = 0 when v = C for all values of E.*

(Or)

(b) Derive an expression for kg.

4. *(a) State and prove Rodrigues formula.*

(Or)

(b) If there is a surface of minimum area passing through a closed space curve then prove that it is necessarily a minimal surface lie a surface of zero mean curvature.

5. *(a) Prove that the only compact surfaces whose Gaussian curvature constant mean curvature constant are spheres.*

(Or)

(b) Prove that in a closed region R of a surface of constant positive Gaussian curvature without umbilics, the principal curvatures take their extreme values at the Boundary.

SECTION – B (3 x 15 = 45)

Answer any THREE of the following questions.

6. *State and prove Fundamental existence theorem for space curves.*
7. *A helicoids is generated by the screw motion of the straight line which meets the axis at an angle ∝ . Find the orthogonal Trajectories of the generators and also find the metric of the surface.*
8. *State and Prove Gauss – Bonnet theorem.*
9. *Prove that a necessary and sufficient condition for a surface to be a developable is that its Gaussian curvature shall be zero.*
10. *State and prove Fundamental Existence theorem for surfaces.*

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