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| **Question Number** | **I** | **II** | **III** | **IV** | **V** | **VI** | **Total** |
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| **Question I:**   1. **For the regular curve**   **find the arc length parameter (arc length function only).**   1. **Let be a unit speed curve whose image lies on a sphere of radiusand center. Then prove that Prove, also that if then**   **Where , and and .**   1. **If a spherical curve has its curvature and torsion , , then find the radius of the spherical curve.** |
| **Question II:**   1. **For the unit speed curve**   **Find**   1. **When do we say that a curve is an involute of ?** 2. **Find the involute of the unit speed curve in (a).**   **Question III:**  **Prove that a curve is defined uniquely by its curvature and torsion as functions of natural parameters.**  **Question IV:**  **Let be a simple surface defined by , and , be defined by . Then answer the following:**  **Find the following curvatures**   1. **Geodesic curvature . Is a geodesic?** 2. **Normal curvature .** 3. **The curvature of**   **Question V:**  **For the simple surface answer the following**   1. **Find the Weingarten map.** 2. **Show that the Gaussian curvature is constant** 3. **Find the mean curvature.** 4. **Is the surface minimal? Explain your answer.**   **Question VI:**   1. **Let be defined by**   **Is a simple surface?**   1. **Let be a simple surface. Then prove the following:** 2. **, where** 3. **For any unit speed curve then** 4. **Show that the tangent planes of the simple surface where is a differentiable function, all pass through the origin.**   Good Luck ☺ |