| **S.No** | **Application Domain** | **Complex Problem Identified** | **Justification** |
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| 1. | Computer Science, Cryptography, Material Science | Quantum Computing Algorithm Design | Quantum computing algorithm design is a complex problem because it requires creating algorithms that efficiently exploit the unique principles of quantum mechanics. Unlike classical computing, which relies on bits (0s and 1s), quantum computing operates with **qubits** that leverage **superposition** and **entanglement** to process information differently. |
| 2. | Nuclear Physics, Engineering | Extreme Conditions for Fusion to Occur | Fusion energy—the process of generating energy by fusing atomic nuclei—is a complex problem because it requires overcoming extreme physical, engineering, and economic challenges. While nuclear fusion powers the sun, replicating this process on Earth in a controlled, efficient, and sustainable way is incredibly difficult. |
| 3. | Aerospace Engineering, Biology, AI | Harsh Space Environment | Space exploration and colonization are among the most challenging problems humanity faces due to the extreme environmental, technological, and societal hurdles involved. Sending humans beyond Earth for long-term survival requires solving a wide range of **scientific, engineering, economic, and ethical** issues. |