


**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**

**CERTIFICATE**

This is to certify that the thesis entitled "**Design and Development of Data Provenance Frameworks For SQL and NoSQL Databases Using Zero-Information Loss Database Concept**", submitted by **Asma Rani** ID. No **2013PHXF0601P** for the award of Ph.D. degree of the Institute, embodies original work done by her under our supervision.

**Signature of the Supervisor** :  
**Name** : PROF. NAVNEET GOYAL  
**Designation** : Professor  
Department of Computer Science  
and Information System,  
BITS Pilani, Pilani Campus  
Pilani, India

**Date** : 18 August 2021

**Signature of the Co-supervisor** :   
**Name** : PROF. SHASHI K. GADIA  
**Designation** : Associate Professor  
Department of Computer Science  
Iowa State University,  
Iowa, United States

**Date** : 18 August 2021