



**BIRLA INSTITUTE OF TECHNOLOGY &  
SCIENCE PILANI – 333 031 (RAJASTHAN)  
INDIA**

## **CERTIFICATE**

This is to certify that the work reported in the Ph.D. thesis entitled **“Probing cosmological dark matter and dark energy using post reionization neutral intergalactic medium”**, submitted by **Ashis Kumar Pal**, ID.No. **2017PHXF0106P** at Physics Department, BITS-Pilani, Pilani Campus for the award of the degree of Doctor of Philosophy (Ph.D.), is a bonafide record of his original work carried out under my supervision. This work has not been submitted elsewhere for any other degree or diploma.

Signature: .....

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Date: .....