

**DECLARATION BY THE CANDIDATE**

I, "*GAURAV KUMAR GUGLIANI*", certify that the work embodied in this thesis is my own bona fide work and carried out by me under the supervision of "*Associate Prof. Arnab Sarkar (Supervisor) and Prof. S. Mandal (Co- Supervisor)*" from "*DECEMBER 2013*" to "*April 2018*", at the "*MECHANICAL ENGINEERING DEPARTMENT /IIT BHU*", Indian Institute of Technology, Varanasi. The matter embodied in this thesis has not been submitted for the award of any other degree/diploma. I declare that I have faithfully acknowledged and given credits to the research workers wherever their works have been cited in my work in this thesis. I further declare that I have not willfully copied any other's work, paragraphs, text, data, results, *etc.*, reported in journals, books, magazines, reports dissertations, theses, *etc.*, or available at websites and have not included them in this thesis and have not cited as my own work.

Date :

Signature of the Student

Place: Varanasi

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