



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI  
SHORT ABSTRACT OF THESIS

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Programme of Study : Ph.D.  
Thesis Title: If-then-else over the algebra of conditional logic  
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Thesis Submitted to the Department/ Center : Department of Mathematics  
Date of completion of Thesis Viva-Voce Exam : 3<sup>rd</sup> February, 2018  
Key words for description of Thesis Work : Axiomatization, if-then-else, non-halting programs, C-algebra

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This thesis aims at giving an axiomatization for the operation of if-then-else over algebras of non-halting programs and non-halting tests, and further, makes use of this axiomatization to study structural properties of the algebra of conditional logic.

To this aim the thesis introduces the notion of  $C$ -sets by considering the tests from a  $C$ -algebra. When the  $C$ -algebra is an *ada*, the axiomatization is shown to be complete through a subdirect representation. Further, this thesis gives an axiomatization for the equality test along with if-then-else through the notion of agreeable  $C$ -sets, which is complete for the class of agreeable  $C$ -sets where the  $C$ -algebra is an *ada*. The thesis also introduces the notion of  $C$ -monoids which consider the composition of programs as well as composition of programs with tests along with if-then-else. A Cayley-type theorem is obtained in that every  $C$ -monoid where the  $C$ -algebra is an *ada* is embeddable in a functional  $C$ -monoid.

The thesis also uses the if-then-else action to study the structure of  $C$ -algebras through the notions of annihilators and idempotence, through which a classification of elements of the  $C$ -algebra of transformations  $3^X$  is achieved. The thesis also proposes the notions of atoms and atomicity in  $C$ -algebras and obtains a characterisation of atoms in  $3^X$ . Further, the thesis presents necessary or sufficient conditions for the atomicity of  $C$ -algebras and shows that the class of finite atomic  $C$ -algebras is precisely that of finite *adas*.