سامية محمد مصطفى



شبكة المعلومات الحامعية

بسم الله الرحمن الرحيم



-Caro-

سامية محمد مصطفي



شبكة العلومات الحامعية



شبكة المعلومات الجامعية التوثيق الالكتروني والميكروفيلم





سامية محمد مصطفى

شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسو

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة يعيدا عن الغيار



سامية محمد مصطفي



شبكة المعلومات الجامعية



المسلمة عين شعور المسلمة عين شعور المسلمة عين شعور المسلمة عين شعور المسلمة ا

سامية محمد مصطفى

شبكة المعلومات الحامعية



بالرسالة صفحات لم ترد بالأصل



EL-Minufiya University Faculty of Science Department of Mathematics

FOLDING AND COVERING SPACES

A Thesis

Submitted to the Faculty of Science, Minufiya University, In Partial Fulfilment of the Requirement for (M. Sc.) Degree in Pure Mathematics

Yasser Abd El-Moneam Hassan El-Meshtawy

B. Sc. (Pure Mathematics 1995)

Supervisors

Prof. Dr. Entesar Mohamed EL-Kholy Professor of Pure Mathematics, Head of Mathematics Department

Faculty of Science,

Tanta University E-EL-Kholy

Dr. Ramadan Abd El-ATY Mahmoud

Assistant Professor of Pure

Mathematics, Dept. of Math., Faculty of

Science,

Minufiya University

Dr. Abd El-Aziz Abd El-Fatah El-Sherbiny

A. Elsherhing Lecturer of Pure Mathematics, Faculty of Science, Minufiya University

Tul 2002

Refree Commette:

1. Prof Dr. M. E. Abd El-Monsef, Professor of Mathematics, of Dean Faculty of Science, Tanta University, Tanta, Egypt

2. Prof. Dr. Mabrouk M. El-Ghoul, Professor of Pure Mathematics, Faculty of M. EL-Ghoul Science, Tanta University.

3. Prof. Dr. Entesar M. EL-Kholy, Head of Mathematics Department, Faculty of E.EL-Khom Science, Tanta University.

4. Prof. Dr. Ramadan Abd El-ATY Mahmoud, Assistant Professor of Pure Mathematics, Dept. of Math., Faculty of Science, Minufiya University

R. A. Mahmana

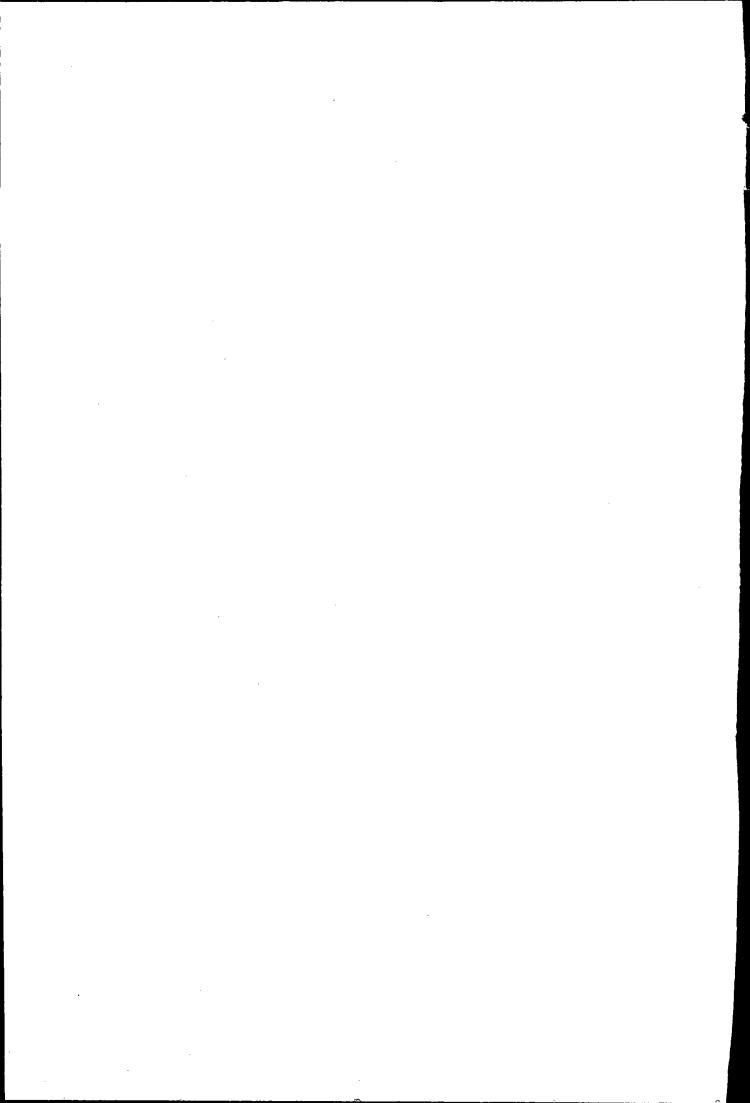
* I''' . • might ! $\mathcal{F}_{i} = \{ e_i \mid e_i \in \mathcal{E}_i \}$ • •

الله المحالية

الله المال ا

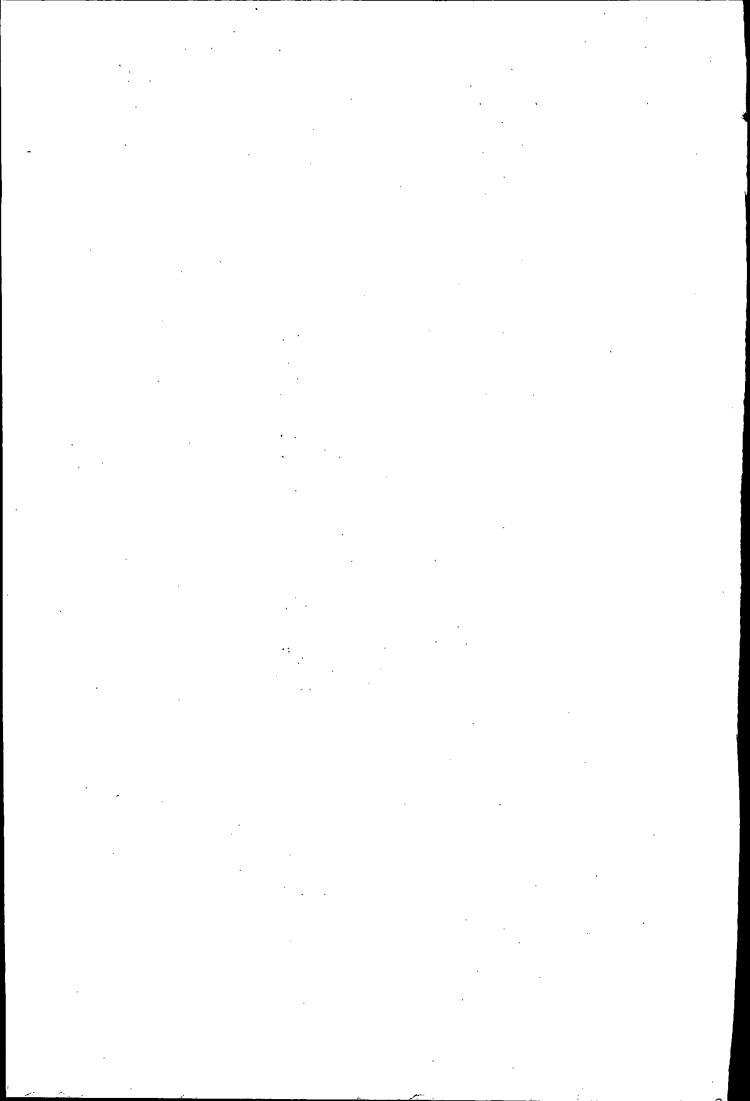


صدق الله العظيم (سورة البقرة . الآية - ٣٢)



Contents

•			page
Introduction			
Chapter one	:	THE FUNDAMENTAL GROUP	1
(1.1)	:	Homotopy of continuous maps	3
(1.2)	:	Homotopy of paths	9
(1.3)	:	The fundamental group	15
Chapter Two	:	COVERING SPACES	20
(2.1)	:	Arcwise connected spaces	20
(2.2)	:	Covering spaces	21
(2.3)	:	The lifting problem	26
(2.4)	:	Homomorphisms and automorphisms of covering	
		spaces	29
(2.5)	:	Regular covering spaces	30
Chapter Three	:		
		GROUPS	34.
(3.1)	:	The fundamental group of a circle	34
(3.2)	:	The fundamental group of a product	35
(3.3)	:	Seifert-Van Kampen Theorem's	35
(3.4)	:	Structure of the fundamental group of a compact surface	41
Chapter Four	:	INVARIANT CELLULAR FOLDING	47
(4.1)	:	Regular CW-complexes	47
(4.2)	:	Directed complexes	55
(4.3)	:	Cellular functions	56
(4.4)	:	Cellular foldings	60
(4.5)	:	Invariant cellular folding	64
Appendix	:		76
References			83
Arabic Summa	ry		



Aknowledgment

All gratitude and thankfulness to Almighty **ALLAH** for guiding and helping me to bring this work to light.

I would like to say that words are not enough and incapable to express exactly my own inner feeling to words my supervisor **Prof. Dr. Entesar Mohamed El-Kholy**, Head of Mathematics Department, Faculty of Science, Tanta University for suggesting the topics presented in this thesis and for helpful discussion and guidance through her Supervision and for her valuable help during the preparation of this thesis.

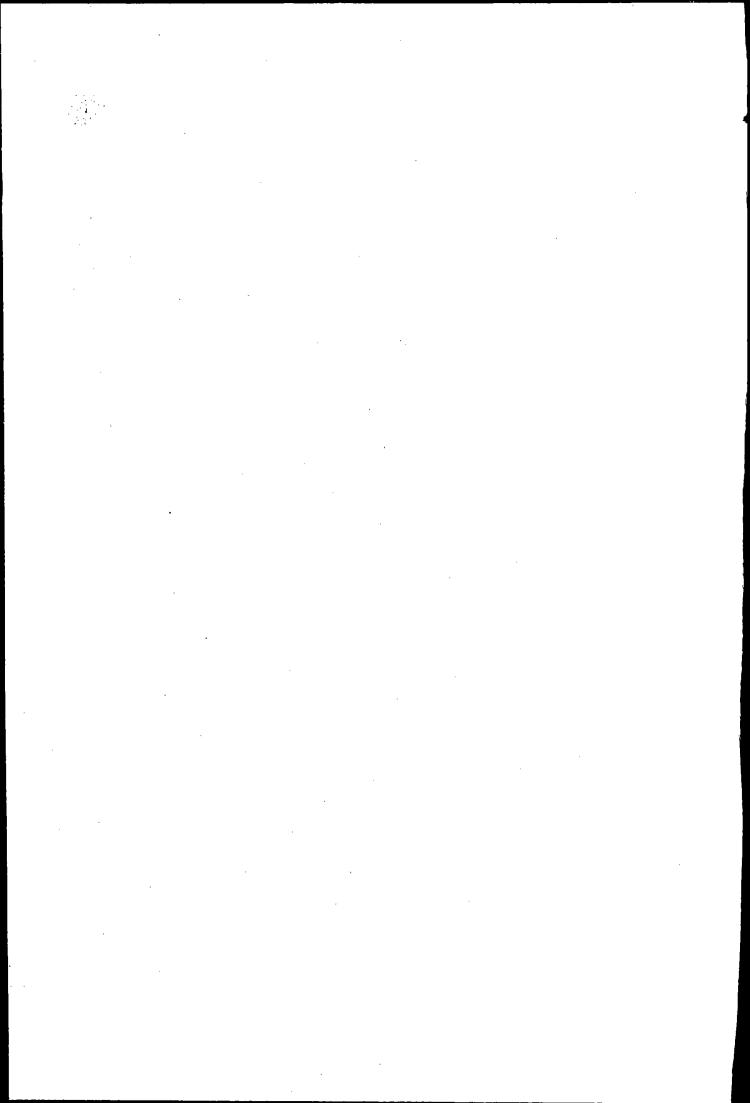
My gratitude and deep thanks are dedicated to my supervisor Assistant **Prof. Dr. Ramadan Abd El-Atty Mahmoud** Assistant Professor of Pure Mathematics, Deptartment of Mathematics, Faculty of Science, Minufiya University, for his interest, continuous help and encouragment.

My thanks are also to **Dr. Abd El-Aziz Abd El-Fatah El-Sherbiny** Lecturer of Department of Mathematics, Faculty of Science, El-Minufiya University, for encouragement, and support.

I wish to express my great thanks for all the staff at the Deptartment of Mathematics, Faculty of Science, Minufiya University, and also for **Prof. Dr. Mohamed El-Shakh**, Head of Mathematics Department, Faculty of Science, Minufiy University and **Prof. Dr. Nabawia El-Ramly**, for their faithful guidance and encouragement.

Also, my gratitude to all members of Mathematics Department, Minufiya University, for their interest and help.

Yasser El-Meshtawy







Introduction





· .