



### $\oplus$ -s-extending modules

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#### Abstract

The concept  $\oplus$ -s-extending modules will be purpose of this paper, a module  $M$  is  $\oplus$ -s-extending if each submodule in  $M$  is essential in submodule has a supplement that is direct summand. Initially, we give relation between this concept with weakly supplement extending modules and  $\oplus$ -supplemented modules. In fact, we gives the following implications:

Lifting modules  $\implies \oplus$ -supplemented modules  $\implies \oplus$ -s-extending modules  $\implies$  weakly supplement extending modules.

It is also we give examples show that, the converse of this result is not true. Moreover, we study when the converse of this result is true.

**Keyword:** Extending modules, weakly supplement extending modules,  $\oplus$ -supplemented modules,  $\oplus$ -s-extending modules.

#### 1. Introduction

In this paper, motivated by the concept of closed  $\oplus$ -supplemented that is, a module  $M$  is called closed  $\oplus$ -supplemented, if each closed submodule in  $M$  has a supplement which is direct summand, and weakly supplement extending module we give concept that is  $\oplus$ -s-extending module, a module  $M$  is  $\oplus$ -s-extending if each submodule in  $M$  is essential in submodule has a supplement which is direct summand. We can answer the question: When is the  $\oplus$ -s-extending module inherited by direct summand.

Following [1], Studied a weakly supplement extending modules, a module  $M$  is called weakly supplement extending if each submodule in  $M$  is essential in weakly supplement submodule in  $M$ . Also,  $\oplus$ -supplemented module were studied by [2]. A module  $M$  is  $\oplus$ -supplemented, if for any submodule  $N$  in  $M$  has a supplement which is

# Extending Modules

**Padhraic Smyth**



## **Extending Modules:**

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*Module Theory, Extending Modules and Generalizations* Adnan Tercan, Canan C. Yücel, 2016-05-13 The main focus of this monograph is to offer a comprehensive presentation of known and new results on various generalizations of CS modules and CS rings Extending or CS modules are generalizations of injective and also semisimple or uniform modules While the theory of CS modules is well documented in monographs and textbooks results on generalized forms of the CS property as well as dual notions are far less present in the literature With their work the authors provide a solid background to module theory accessible to anyone familiar with basic abstract algebra The focus of the book is on direct sums of CS modules and classes of modules related to CS modules such as relative injective ejective modules quasi continuous modules and lifting modules In particular matrix CS rings are studied and clear proofs of fundamental decomposition results on CS modules over commutative domains are given thus complementing existing monographs in this area Open problems round out the work and establish the basis for further developments in the field The main text is complemented by a wealth of examples and exercises

**Lifting Modules** John Clark, Christian Lomp, N. Vanaja, Robert Wisbauer, 2008-08-17 Extending modules are generalizations of injective modules and dually lifting modules generalize projective supplemented modules There is a certain asymmetry in this duality While the theory of extending modules is well documented in monographs and text books the purpose of our monograph is to provide a thorough study of supplements and projectivity conditions needed to investigate classes of modules related to lifting modules The text begins with an introduction to small submodules the radical variations on projectivity and hollow dimension The subsequent chapters consider preradicals and torsion theories in particular related to small modules decompositions of modules including the exchange property and local semi T nilpotency supplements in modules with specific emphasis on semilocal endomorphism rings finishing with a long chapter on lifting modules leading up their use in the theory of perfect rings

Harada rings and quasi Frobenius rings Most of the material in the monograph appears in book form for the first time The main text is augmented by a plentiful supply of exercises together with comments on further related material and on how the theory has evolved

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### **Table of Contents Extending Modules**

1. Understanding the eBook Extending Modules
  - The Rise of Digital Reading Extending Modules
  - Advantages of eBooks Over Traditional Books
2. Identifying Extending Modules
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Extending Modules
  - User-Friendly Interface
4. Exploring eBook Recommendations from Extending Modules
  - Personalized Recommendations
  - Extending Modules User Reviews and Ratings

- Extending Modules and Bestseller Lists
- 5. Accessing Extending Modules Free and Paid eBooks
  - Extending Modules Public Domain eBooks
  - Extending Modules eBook Subscription Services
  - Extending Modules Budget-Friendly Options
- 6. Navigating Extending Modules eBook Formats
  - ePub, PDF, MOBI, and More
  - Extending Modules Compatibility with Devices
  - Extending Modules Enhanced eBook Features
- 7. Enhancing Your Reading Experience
  - Adjustable Fonts and Text Sizes of Extending Modules
  - Highlighting and Note-Taking Extending Modules
  - Interactive Elements Extending Modules
- 8. Staying Engaged with Extending Modules
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Extending Modules
- 9. Balancing eBooks and Physical Books Extending Modules
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Extending Modules
- 10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
- 11. Cultivating a Reading Routine Extending Modules
  - Setting Reading Goals Extending Modules
  - Carving Out Dedicated Reading Time
- 12. Sourcing Reliable Information of Extending Modules
  - Fact-Checking eBook Content of Extending Modules
  - Distinguishing Credible Sources

13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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