



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

# جامعة عين شمس

التوثيق الالكتروني والميكروفيلم



نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها  
علي هذه الأفلام قد اعدت دون أية تغيرات



## يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of  
15 – 25c and relative humidity 20-40 %



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# بعض الوثائق الأصلية تالفة



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بالرسالة صفحات

لم ترد بالأصل

**COMPARISON BETWEEN OPTIMUM SOLUTIONS  
USING THE  
INVENTORY TECHNIQUES AND AI TECHNIQUES BY  
BUILDING A MATHEMATICAL MODEL FOR  
OPTIMUM UTILITY OF INVENTORY  
UNDERGROUND WATER IN EGYPT**

**THESIS**

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In Mathematics " Pure Mathematics "*

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## INTRODUCTION

## INTRODUCTION

Egypt needs to raise its agricultural production during a period with a reduced availability of Nile water from lake Nasser. This increase in agricultural production has to be achieved mainly from the Nile Valley and Delta (Fig. 1). During the last two decades, the annual runoff of the Nile River has declined to below its average (55.5 billion m<sup>3</sup>/year). This brought into attention the necessity for effective usage of available underground water resources (4.9 billion m<sup>3</sup>/year) (*Diab, 1992; Biswas, 1991*).

Although these resources represent 9% of the total water available in Egypt, only 3% are currently used (*see Diab, 1992 and Farid, 1988*).

Development of underground water resources plays an important role for the efficient use of the Nile water resources and for the control of the underground water table.

Underground water in itself is not a resource as it originates from the Nile (indirectly). Underground water development for irrigation aims at improving drainage conditions along with achieving a better distribution of irrigation water. However, because there is a significant difference between surface water resources and underground water, we have to be careful in developing our underground water resources.

Less reliable information is available on underground water than on surface water.

As surface water supplies to Egypt are limited by the present quota of the Nile, and already water shortage occurs during the summer season, this underground water storage basin becomes an important factor in the