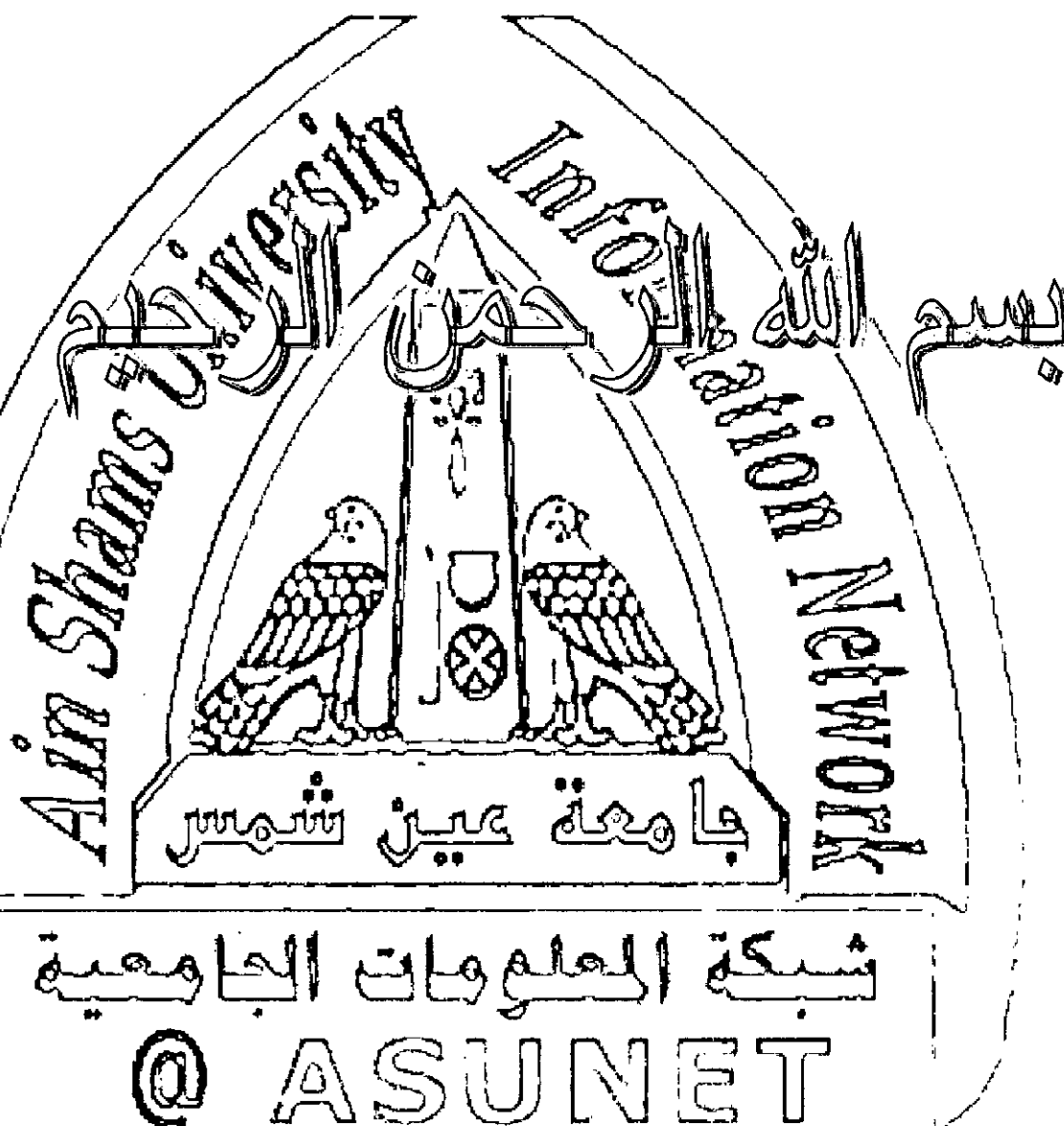




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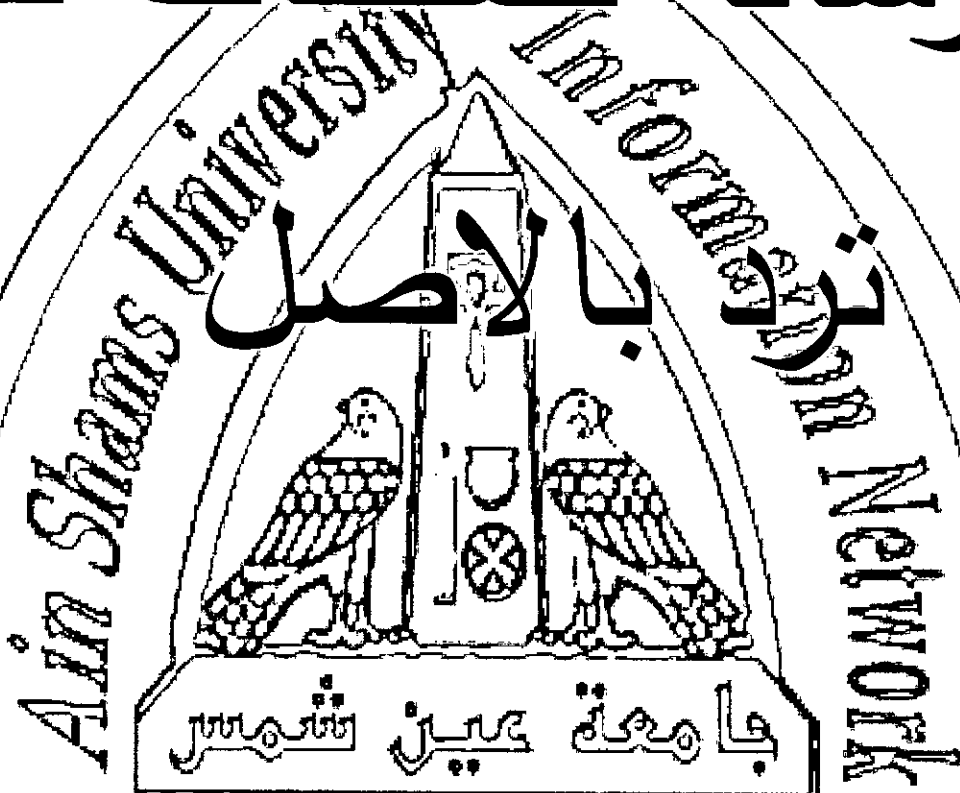


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**Developing an Analytical Program for Solving the
Analytical Equations of Fully /Partially Penetrating Wells,
Using Matlab Program.**

By

Eng.\ Hany Gomaa Ahmed El_Said

A Thesis submitted to the
Faculty of Engineering at Cairo University
In partial Fulfillment of the Requirements
For the degree of
Master of Science
In
Irrigation and Hydraulics

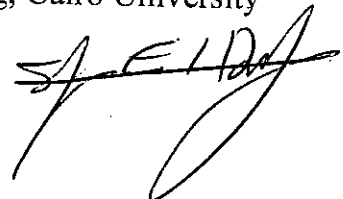
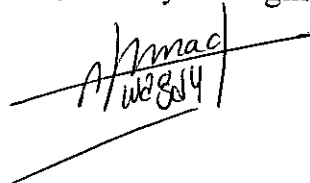
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Faculty of Engineering – Cairo University

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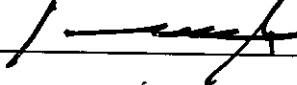
Prof. Dr. Sherif Mohamed Ahmed El-Didy , Advisor



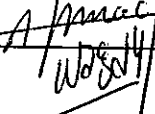
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Abstract

In general, wells partially penetrate the entire thickness of the aquifer. If the length of water entry (or the screen interval) in a well is less than the entire thickness of the aquifer, the well is called *partially penetrating well*. The influence of partial penetration of a well becomes less pronounced as the ratio between the screen interval and the aquifer thickness increases. The groundwater flow to or from a partially penetrating well is three dimensional. As a result, the drawdown around pumping and observation wells is dependant on their screened lengths and location along the thickness of the aquifer. A few number of computer programs appears to provide solutions for partially penetrating well, but, none of these programs deals with all equations of fully/partially penetrating wells, for all kinds of aquifers, and for all flow conditions. Moreover, the free access programs are extremely limited.

The main objective of this study is to develop an analytical program, using Matlab program, for solving the analytical equations of groundwater wells. The equations are developed by Theis, Hantush, Jacob, and Neuman covering confined aquifers, semi-confined aquifers, and unconfined ones. The program saves the time and effort of calculations for solving the complicated analytical equations. The program is a visual interacting one, but this interface is made using Matlab program, with the advantage of reducing the probability of error in entering data. The solutions simulate different conditions of fully/ partially penetrating wells in steady and unsteady conditions.

More understanding of the wells hydraulics has been achieved through using the program. A group of dimensionless curves are prepared for fine, medium, and coarse sand, to predict the increase in drawdown or the decrease in discharge due to the wells partial penetration. Some specific problems, concerning wells hydraulics, are investigated. The additional drawdown due to partial penetration is also addressed. The effective aquifer thickness in case of well partial penetration is identified. The optimum screen length for maximum well yield, is also predicted. The radius of influence of wells, is finally determined by the program.

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Table of Contents

Abstract.....	ii
Acknowledgement.....	iii
List of Figures	viii
List of Tables.....	xx
 CHAPTER 1 : Introduction	 1
1-1 Overview	1
1-2 Thesis objective.....	1
1-3 Thesis organization.....	2
 CHAPTER 2 : Occurrence and Movement of Groundwater.....	 4
2-1 General	4
2-2 Hydrologic Cycle	4
2-3 Subsurface Distribution	5
2-4 Aquifer Formation	5
2-4-1 Unconfined aquifers	6
2-4-2 Confined aquifers	6
2-4-3 Semi-confined aquifers	6
2-4-4 Perched aquifers	6
2-5 Hydraulic and Hydrogeologic Characteristics of aquifers	7
2-5-1 Hydraulic Head	7
2-5-2 Porosity, and Effective Porosity	8
2-5-3 Darcy's Law	9
2-5-4 Hydraulic Conductivity	9
2-5-5 Transmissivity	10
2-5-6 Homogeneity and Isotropy	11
2-6 Compressibility and Elasticity of aquifers	11
2-6-1 Specific storage	11
2-6-2 Specific yield	12
2-6-3 Specific Retention	13
2-6-4 Storage coefficient	13
2-6-4-1 Storage coefficient of a confined aquifer	13

4-2	Simpson's integration method	59
4-2-1	General	59
4-2-2	Special integrated function	61
4-3	Confined / semi-confined Aquifer	66
4-3-1	Fully Penetrating Well	66
4-3-1-1	Verification of Hantush and Jacob well function	66
4-3-1-2	Reduction of Hantush and Jacob well function to Theis well function	68
4-3-1-3	Reduction of Hantush and Jacob well function to steady-state semi –confined aquifer	70.
4-3-2	Partially Penetrating Well	72
4-3-2-1	Drawdown in piezometer and wells	72
4-3-2-2	Drawdown in observation well	75
4-4	Unconfined Aquifer	80
4-4-1	Boulton model for fully penetrating well	80
4-4-1-1	Without delayed response	80
4-4-1-2	With delayed response.....	87
4-4-2	Neuman models	91
4-4-2-1	Reduction to Neuman equation for fully penetrating well.	91
4-4-2-2	Reduction to Theis equation for fully penetrating well in confined aquifer	119
4-4-2-3	Reduction to Hantush equation for partially penetrating well in confined aquifer	122
CHAPTER 5 : Applications of the analytical Program		126
5-1	General	126
5-2	Additional drawdown Estimation.	126
5-2-1	Additional drawdown in leaky aquifer- steady state case.	126
5-2-1.1	Standard curves for fully penetrating well ($L/b = 1.0$).	127
5-2-1.2	Standard curves foe partially penetrating well ($L/b \neq 1.0$). ...	132
5-2-2	Additional drawdown for partially penetrating well in confined Aquifer.	160
5-2-2.1	Steady state case.	160
5-2-2.2	Unsteady state case.	163

5-3	Effective aquifer thickness.	173
5-3-1	General	173
5-3-2	Hantush's equation in a dimensionless formula.....	175
5-3-3	Detection of effective aquifer thickness.	176
5-3-4	Ratio of the increase in drawdown due to partial penetration. ...	187
5-3-5	Reduction in the discharge rate due to partial penetration.	196
5-4	Optimum screen length for maximum well yield from unlimited aquifer thickness , in confined aquifer.....	206
5-5	Radius of influence for partially penetrating well in confined aquifer at steady state case.	209
CHAPTER 6 : Summary, Conclusions and Recommendations		214
6-1	Summary.	214
6-2	Conclusions.....	214
6-3	Recommendations for future work	217
References		218
Appendix A		221
Appendix B		245

List of Figures

Fig. (2-1)	: Hydrologic Cycle.	4
Fig. (2-2)	: Subsurface distribution of water.	5
Fig. (2-3)	: Aquifer Formation.	6
Fig. (2-4)	: Hydraulic Head Components.	7
Fig. (2-5)	: Homogeneity and Isotropy.	11
Fig. (2-6)	: Elemental Control Volume.	14
Fig. (3-1)	: Fully Penetrating Well in a Confined Aquifer.	18
Fig. (3-2)	: Standard Curve of Theis well function $W(u)$	21
Fig. (3-3)	: Fully Penetrating Well in a Semi-Confined Aquifer.	23
Fig. (3-4)	: Partially Penetrating Well in a semi-confined Aquifer.	28
Fig. (3-5)	: Graph of s_p versus (b/r_w) for different values of (L_e/b) (From Sternberg 1973).	32
Fig. (3-6)	: Partially penetrating well in confined aquifer with open section (a) at top of the aquifer, (b) at bottom of the aquifer, (c) and in Center of the aquifer.	32
Fig. (3-7)	: Partially Penetrating Wells.	33
Fig. (3-8)	: Relationship of Partially Penetrating and attainable specific Capacity for wells in homogeneous artesian aquifers.	34
Fig. (3-9)	: Fully Penetrating Well in an unconfined aquifer.	36
Fig. (3-10a)	: Initial cone of depression in an unconfined aquifer.	38
Fig. (3-10b)	: Gravity drainage of the cone of depression in an unconfined Aquifer.	39
Fig. (3-10c)	: Cone of depression under equilibrium conditions in an Unconfined aquifer.	39
Fig. (3-10d)	: Delayed response of the drawdown in an unconfined aquifer..	40
Fig. (3-11)	: Boulton's correction factor, C_f , for $\tau < 0.05$	43
Fig. (3-12)	: Boulton's correction factor, C_f , for $\tau > 5$	44
Fig. (3-13)	: A Partially penetrating well in an unconfined aquifer	52
Fig. (4-1)	: Description of Simpson method.	60
Fig. (4-2)	: The shape of the special integration.	61
Fig. (4-3)	: Integration method using variable dx	62
Fig. (4-4)	: Theis curve against program results for constant dx	64

Fig. (4-5)	: Theis curve, against program results for variable dx.....	65
Fig. (4-6)	: The standard Hantush and Jacob well function.(Table A-2). ..	67
Fig. (4-7)	: The standard Hantush and Jacob well function from program.....	67
Fig. (4-8)	: Comparison between standard Hantush and Jacob well function , and the same from program.....	68
Fig. (4-9)	: Comparison between standard Hantush function $W(u,0)$ for confined aquifer, and Theis function $W(u)$	70
Fig. (4-10)	: Comparison between standard Hantush function $W(0,(r/B))$ for semi-confined aquifer (steady state) , and value $2Ko(r/B)$ program	72
Fig. (4-11)	: Schematic representation of a semi confined aquifer partially Penetrated well by a discharging well whose screen extends to the top of the aquifer.	75
Fig. (4-12)	: Comparison between original data, and program results for case (1).	77
Fig. (4-13)	: Comparison between original data , and program results for case (2).	78
Fig. (4-14)	: Comparison between original data , and program results for case (3).	79
Fig. (4-15)	: The exact values of gravity function $V(\rho,\tau)$,fromTable (A-3)	81
Fig. (4-16)	: The results of the program for gravity function $V(\rho,\tau)$	81
Fig. (4-17)	: Comparison between the results of the program , and The exact values for gravity function $V(\rho,\tau)$	82
Fig. (4-18)	: Values of the parameter m for $0.05 \leq \tau < 5$	85
Fig. (4-19)	: Family of Boulton type A curves for fully penetrating well in unconfined aquifer (standard curves).	88
Fig. (4-20)	: Family of Boulton type B curves for fully penetrating well in unconfined aquifer (standard curves).	88
Fig. (4-21)	: Family of Boulton type A curves for fully penetrating well in unconfined aquifer (program's results).	89
Fig. (4-22)	: Family of Boulton type B curves for fully penetrating well in unconfined aquifer (program's results).	89