



Cairo University

# **NUMERICAL AND EXPERIMENTAL SIMULATION FOR AIR FLOW AND TEMPERATURE DISTRIBUTION IN ISLAMIC WORSHIP PLACES**

**By**

**Eng. Mohamed Abdul Wahed Mohamed Khalefa**

**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**

**MECHANICAL POWER ENGINEERING**

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### **Title of Thesis:**

Numerical and Experimental Simulation for Air Flow and Temperature Distribution in Islamic Worship Places

### **Key Words:**

Numerical; Experimental; Temperature Distribution Air Velocity; Worship places

### **Summary:**

This research aims to study, analyse and modelling the air flow and temperature distribution inside the air conditioned worship places, specifically those that contain high rise ceiling. The mosque of Faculty of Engineering – Cairo University has been selected in this thesis to obtain experimental and mathematical models of analytical studies because it has one of air conditioning application. In this research the slandered k – model was selected according to the results analysis and comparison between different models.

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# Nomenclature

<i>Symbol</i>	<i>Quantity</i>
C	Constant
C <sub>p</sub>	Constant pressure specific heat, J/kg.K
d	Distance, m
D <sub>im</sub>	Diffusion coefficient for species in mixture, m <sup>2</sup> /s
D	Fluid Domain
E	Total energy of a fluid particle, J
F	External body forces, N
g	Gravitational acceleration, m/s <sup>2</sup>
G	Filter function
G <sub>k</sub>	Turbulent kinetic energy production, m <sup>2</sup> /s <sup>2</sup>
h	Enthalpy, kJ/kg
h <sub>j</sub> <sup>o</sup>	Enthalpy of formation of species, J
H	Height, m
I	Unit tensor Fluctuation intensity
J <sub>j</sub>	Diffusion flux of species, J
k	Thermal conductivity coefficient, W/m°C
K	Dimensionless group describing the turbulent kinetic energy
L <sub>s</sub>	Mixing length, m
L <sub>e</sub>	Lewis number