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

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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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 – ε model was selected according to the results analysis and comparison between different models.

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Nomenclature

Symbol	*Quantity*
C	Constant
Cp	Constant pressure specific heat, J/kg.K
d	Distance, m
D_{im}	Diffusion coefficient for species in mixture, m^2/s
D	Fluid Domain
E	Total energy of a fluid particle, J
F	External body forces, N
g	Gravitational acceleration, m/s^2
G	Filter function
G_k	Turbulent kinetic energy production, m^2/s^2
h	Enthalpy, kJ/kg
h_j^o	Enthalpy of formation of species, J
H	Height, m
I	Unit tensor Fluctuation intensity
J_j	Diffusion flux of species, J
k	Thermal conductivity coefficient, W/m^oC
K	Dimensionless group describing the turbulent kinetic energy
L_s	Mixing length, m
L_e	Lewis number