AIN SHAMS UNIVERSITY
FACULTY OF ENGINEERING
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THE PERFORMANCE OF A DOUBLE ACTING HYDRAULIC DAMPER

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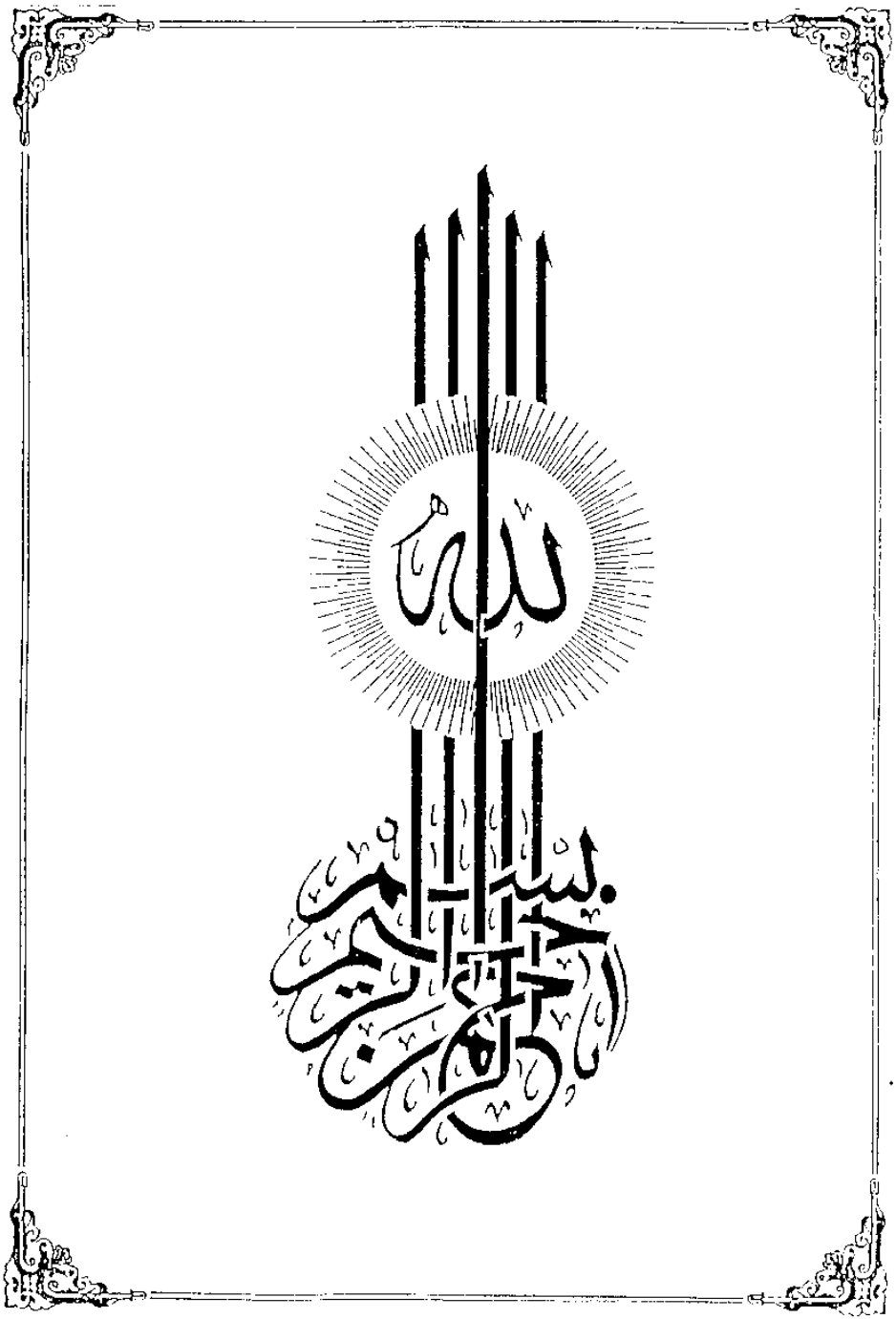

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Notation

X	Displacement of the lower end of the hydraulic damper.	(m)
X_o	Amplitude of displacement of the lower end of the hydraulic damper.	(m)
$\dot{X}$	Velocity of the lower end of the hydraulic damper	(m/sec.)
$\dot{X}_o$	Amplitude of velocity of the lower end of the hydraulic damper.	(m/sec.)
Y	Displacement of the upper end of the hydraulic damper.	(m)
Y_o	Amplitude of displacement of the upper end of the hydraulic damper.	(m)
$\dot{Y}$	Velocity of the upper end of the hydraulic damper.	(m/sec.)
$\dot{Y}_o$	Amplitude of velocity of the upper end of the hydraulic damper.	(m/sec.)
$\ddot{Y}$	Acceleration of the upper end of the hydraulic damper.	(m/sec^2.)
f	Frequency of excitation	(Hz)
t	time	(sec.)
m_1	mass of the lower end of the hydraulic damper.	(kg)
m_2	mass of the upper end of the hydraulic damper.	(kg)
F_f	Coulomb-friction force	(N)
F_r	The output force in the rebound stroke of the hydraulic damper.	(N)
F_c	The output force in the bound stroke of the hydraulic damper.	(N)

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C_t	Damping coefficient of the hydrulic damper in a rebound stroke.	(N.s/m)
C_c	Damping coefficient of the hydraulic damper in a bound stroke.	(N.s/m)
C_{eq_t}	Equivalent damping coefficient of the hydraulic damper in a rebound stroke.	(N.s/m)
C_{eq_c}	Equivalent damping coefficient of the hydraulic damper in abound stroke.	(N.s/m)
C_l	Damping coefficient of the rubber seat.	(N.s/m)
K_l	Stiffness of the rubber seat.	(N/m)
K	Stiffness of the hydraulic damper.	(N/m)

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