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## Asymptotic solutions and stability analysis for generalized non-homogeneous Mathieu equation

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### Abstract

The asymptotic solutions and transition curves for the generalized form of the non-homogeneous Mathieu differential equation are investigated in this paper. This type of governing differential equation of motion arises from the dynamic behavior of a pendulum undergoing a butterfly-type end support motion. The strained parameter technique is used to obtain periodic asymptotic solutions. The transition curves for some special cases are presented and their corresponding periodic solutions with the periods of  $2\pi$  and  $4\pi$  are evaluated. The stability analyses of those transition curves in the  $\varepsilon$ - $\delta$  plane are carried out, analytically, using the multiple scales method. The numerical simulations for some typical points in the  $\varepsilon$ - $\delta$  plane are performed and the dynamic characteristics of the resulting phase plane trajectories are discussed. © 2006 Elsevier B.V. All rights reserved.

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- Nayfeh, A.H., Mook, D.T. (1979) *Nonlinear Oscillations*. Cited 2808 times. Wiley, New York
- Mond, M., Cederbaum, G., Khan, P.B., Zarmi, Y. **Stability Analysis Of The Non-Linear Mathieu Equation** (1993) *Journal of Sound and Vibration*, 167 (1), pp. 77-89. Cited 25 times. doi: 10.1006/jsvi.1993.1322  
View at publisher
- Esmailzadeh, E., Nakhaie-Jazar, G., Mehri, B. **Existence of periodic solution for beams with harmonically variable length** (1997) *Journal of Vibration and Acoustics, Transactions of the ASME*, 119 (3), pp. 485-488. Cited 13 times.
- Ng, L., Rand, R. **Bifurcations in a Mathieu equation with cubic nonlinearities** (2002) *Chaos, Solitons and Fractals*, 14 (2), pp. 173-181. Cited 27 times. doi: 10.1016/S0960-0779(01)00226-0  
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 (2002) *Communications in Nonlinear Science and Numerical Simulation*, 7 (3), pp. 107-121. Cited 9 times.  
 doi: 10.1016/S1007-5704(02)00018-7  
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- 6  Lakrad, F., Azouani, A., Abouhazim, N., Belhaq, M.  
**Bursters and quasi-periodic solutions of a self-excited quasi-periodic Mathieu oscillator**  
 (2005) *Chaos, Solitons and Fractals*, 24 (3), pp. 813-824. Cited 4 times.  
 doi: 10.1016/j.chaos.2004.09.097  
[View at publisher](#)
- 7  Abouhazim, N., Belhaq, M., Lakrad, F.  
**Three-period quasi-periodic solutions in the self-excited quasi-periodic mathieu oscillator**  
 (2005) *Nonlinear Dynamics*, 39 (4), pp. 395-409. Cited 8 times.  
 doi: 10.1007/s11071-005-3399-2  
[View at publisher](#)
- 8  Rand, R., Guennoun, K., Belhaq, M.  
**2:2:1 resonance in the quasiperiodic Mathieu equation**  
 (2003) *Nonlinear Dynamics*, 31 (4), pp. 367-374. Cited 17 times.  
 doi: 10.1023/A:1023216817293  
[View at publisher](#)
- 9  Guennoun, K., Houssni, M., Belhaq, M.  
**Quasi-periodic solutions and stability for a weakly damped nonlinear quasi-periodic Mathieu equation**  
 (2002) *Nonlinear Dynamics*, 27 (3), pp. 211-236. Cited 19 times.  
 doi: 10.1023/A:1014496917703  
[View at publisher](#)
- 10  Zounes, R.S., Rand, R.H.  
**Global behavior of a nonlinear quasiperiodic Mathieu equation**  
 (2002) *Nonlinear Dynamics*, 27 (1), pp. 87-105. Cited 23 times.  
 doi: 10.1023/A:1017931712099  
[View at publisher](#)
- 11  Clifford, M.J., Bishop, S.R.  
**Approximating the Escape Zone for the Parametrically Excited Pendulum**  
 (1994) *Journal of Sound and Vibration*, 172 (4), pp. 572-576. Cited 23 times.  
 doi: 10.1006/jsvi.1994.1199  
[View at publisher](#)
- 12  Bishop, S.R., Clifford, M.J.  
**Zones of chaotic behaviour in the parametrically excited pendulum**  
 (1996) *Journal of Sound and Vibration*, 189 (1), pp. 142-147. Cited 47 times.  
 doi: 10.1006/jsvi.1996.0011  
[View at publisher](#)
- 13  Xu, X., Wiercigroch, M., Cartmell, M.P.  
**Rotating orbits of a parametrically-excited pendulum**  
 (2005) *Chaos, Solitons and Fractals*, 23 (5), pp. 1537-1548. Cited 13 times.  
 doi: 10.1016/j.chaos.2004.06.053  
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- 14  Younesian, D., Esmailzadeh, E., Sedaghati, R.  
**Existence of periodic solutions for the generalized form of mathieu equation**  
 (2005) *Nonlinear Dynamics*, 39 (4), pp. 335-348. Cited 19 times.  
 doi: 10.1007/s11071-005-4338-y  
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