

# Study of one-dimensional Electro-Magneto thermoelastic problem under Modified Caputo-Fabrizio fractional order derivative with moving heat source

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**Abstract:** In this work, a Modified Caputo-Fabrizio fractional order derivative has been used to solve the one-dimensional Electro-Magneto thermoelastic problem for a thermoelastic rod with finite length. The Caputo fractional order derivative has a singular kernel. To overcome the singularity, Caputo and Fabrizio introduced a new fractional order derivative with a non-singular kernel. However, there are some contradictions observed in the Caputo-Fabrizio fractional order derivative definition. To overcome the contradiction, a new modified Caputo-Fabrizio fractional order derivative definition has been introduced in the generalized thermoelasticity. The proposed framework is subsequently used to investigate the transient responses of a finite thermoelastic rod when exposed to a moving heat source. The rod is placed in a time-varying magnetic field and its ends are supposed to be thermally insulated and stationary. The prescribed equations are solved using the Laplace transform technique and the numerical inversion is applied using the Riemann-sum approximation method. The effect of the fractional order parameter and the velocity of the moving heat source has been studied. The outcomes suggest that these factors significantly influence the studied variables.

**Keywords:** Generalized thermoelasticity, Maxwell's Equations, Modified Caputo-Fabrizio fractional order derivative, Moving Heat Source, Numerical Inversion.