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Notice for the PhD Viva-Voce Examination

Ms Anagha Susan John, Registration Number: 2170210, PhD Scholar at the Department of Mathematics, School of Sciences, CHRIST (Deemed to be University) will defend her PhD thesis at the public viva-voce examination on Monday, 24 November 2025 at 11:00 am in Room No. 044, Ground Floor, R&D Block, CHRIST (Deemed to be University), Bengaluru – 560029, Karnataka, India.

Title of the Thesis	:	**Study on Nanofluid Flow and Heat Transfer Between a Cone and a Disk**
Discipline	:	**Mathematics**
External Examiner - I	:	**Dr Amit Mahajan** Associate Professor Department of Applied Sciences National Institute of Technology, Delhi GT Karnal Road Delhi - 110036
External Examiner - II	:	**Dr B M Shankar** Professor Department of S & H PES University, 100 Feet Ring Road Bengaluru - 560058 Karnataka
Supervisor	:	**Dr Mahanthesh B** Associate Professor Department of Mathematics School of Sciences CHRIST (Deemed to be University) Bengaluru - 560029 Karnataka

The members of the Research Advisory Committee of the Scholar, the faculty members of the Department and the School, interested experts and research scholars of all the branches of research are cordially invited to attend this open viva-voce examination.

Registrar (Academics)

Place: Bengaluru
Date: 06 November 2025

ABSTRACT

Rheometric, viscosimetric, biomedical, and various pharmaceutical machineries benefit from the structural advantages offered by the stationary cone-disk (SCDS) geometry. This study investigates the three-dimensional flow of mono/hybrid nanofluids in a stationary cone-disk system (SCDS) with isothermal boundaries, employing different nanofluid models and considering various physical aspects such as thermal radiation, variable fluid properties, Brownian motion, and thermophoresis. Significant temperature gradients, particularly at high operating temperatures, critically impact fluid transport characteristics. Therefore, incorporating temperature-dependent fluid properties is essential for accurate fluid behavior prediction and system performance optimization. Three different nanofluid models, namely, the Khanafer-Vafai-Lightstone (KVL) nanofluid model, the Buongiorno nanofluid model (BNM), and the modified Buongiorno nanofluid model (MBNM), were used to describe the heat transport in nanofluids. The effective thermo-physical properties of nanofluids were described by using the available experimental models and data. The governing equations are formulated as a coupled system of convective-diffusion equations, comprising momentum, thermal energy, and nanoparticle volume fraction (NVF) conservation, along with the incompressibility condition. Lie-group theory is applied to derive the Lie-group scaling transformations, yielding a self-similar model consisting of a nonlinear two-point ordinary boundary value problem. Numerical methods were employed to find approximate solutions for the resulting self-similar models. A comprehensive parametric study was conducted to visualize the behavior of the temperature and velocity profiles, along with the Sherwood and Nusselt numbers at the disk surface. The study analyzes the impact of Rosseland radiative flux, thermophoresis, Brownian motion, and variable fluid parameters on the flow fields for both swirling and non-swirling flow cases. Multivariate quadratic regression models for mass and heat transfer rates at the disk surface are developed. The system's entropy generation is also examined. Statistical analysis is also performed, specifically, by using the Response Surface Methodology (RSM) and central composite design (CCD). The parametric analysis reveals novel and interesting results, and further statistical analysis quantifies the influence of physical parameters on the different fields. It is anticipated that the findings of our research work will complement existing studies and offer valuable information for practical applications.

Keywords: *Nanofluid Flow, Stationary Cone-Disk System, Swirling Flow, Variable Fluid Property, Response Surface Methodology, Sensitivity Analysis*

Publications:

1. **Anagha Susan John**, Mahanthesh Basavarajappa, Igor V. Shevchuk, "Study of nanofluid flow and heat transfer in a stationary cone-disk system", Thermal Science and Engineering Progress, vol. 46, pp. 102173, 2023.
2. **Anagha Susan John**, Mahanthesh Basavarajappa, Igor V. Shevchuk, "Study of nanofluid flow in a stationary cone-disk system with temperature-dependent viscosity and thermal conductivity", Physics of Fluids, vol. 36, no. 5, pp. 052001, 2024.
3. **Anagha Susan John**, Mahanthesh Basavarajappa, G. Lorenzini, "Study of hybrid nanofluid flow in a stationary cone-disk system with temperature-dependent fluid properties", Applied Mathematics and Mechanics (English Edition), vol. 45, no. 4, pp.677-694, 2024.
4. **Anagha Susan John**, Mahanthesh Basavarajappa, Igor V. Shevchuk, "Entropy generation analysis for nanofluid flow in a stationary cone-disk system", (Submitted to International Journal of Numerical Methods for Heat & Fluid Flow).