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Notice for the PhD Viva Voce Examination

Ms Heena Firdose (Registration Number: 2071508), PhD scholar at the School of Sciences, CHRIST (Deemed to be University), Bangalore will defend her PhD thesis at the public viva-voce examination on Saturday, 8 June 2024 at 11.00 am in Room No. 044, Ground Floor, R & D Block, CHRIST (Deemed to be University), Bengaluru - 560029.

Title of the Thesis	:	**A Theoretical Study of Rayleigh-Bénard Convection Problem with Realistic and Artificial Boundary Conditions**
Discipline	:	**Mathematics**
External Examiner (Outside Karnataka)	:	**Dr Ravi Ragoju** Associate Professor Department of Applied Sciences National Institute of Technology Salcete Taluka, South Goa District Goa - 40370
External Examiner (Within Karnataka)	:	**Dr Prasanna B M R** Associate Professor Department of Mathematics Siddaganga Institute of Technology Tumkur Karnataka - 572103
Supervisor	:	**Dr Pradeep G Siddheshwar** Senior 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

Place: Bengaluru
Date: 03 June 2024

ABSTRACT

In this thesis we present linear and weakly non-linear study of Rayleigh-Bénard convection subject to general boundary condition, which includes both physically realistic and artificial boundaries. A horizontal configuration is adopted, wherein the horizontal surfaces are attached to porous blocks, which allows for the inclusion of rough boundaries modelled by the Robin boundary condition on velocity. The Robin boundary condition is utilised to model boundary condition on temperature as well. Thus, the usage of general boundary condition paves a way to integrate 16 different Rayleigh-Bénard convection problems into one single problem. A Biot number and slip-Darcy number parametrise the study which arise because of the boundary condition. Adding nanoparticles to a base fluid result in an increased thermal conductivity of the base fluid.

The thermophysical properties of the nanofluid are obtained using phenomenological laws and mixture theory. The present study explores performances of different types of nanofluids, mono nanofluid and hybrid nanofluid in heat transfer systems. The comparative study pertaining to nanofluids provides theoretical assistance to make an efficient choice of the nanofluid for convection problems. The objective of this research is to present a conducive understanding of the effect of nanoparticles and its enhanced thermophysical properties' effects on the onset of convection.

Keywords: Rayleigh-Bénard Convection, Rough Boundaries, General Boundary Condition, Robin Boundary Condition, Nanofluid, Mono Nanofluid, Hybrid Nanofluid.

Publications:

1. Heena Firdose, P. G. Siddheshwar, Reena Nandal, and Ruwaidiah Idris, "Radiation Effect on Rayleigh-Bénard Convection in Nanofluids: General Boundary Condition", Advancements in Nanotechnology for Energy and Environment, pp. 229–255, Springer Nature, Singapore, 2022. https://doi.org/10.1007/978-981-19-5201-2_12.
2. Heena Firdose, P. G. Siddheshwar, and Ruwaidiah Idris, "A Study of a Thermally-Vigorous Rayleigh-Bénard Convection in a Hybrid Nanofluid using Non-Classical Boundary Condition", Journal of Nanofluids, vol.12, no.4, pp. 1049-1066, 2023. https://doi.org/10.1166/jon.2023.1940.
3. Heena Firdose, P. G. Siddheshwar, and Ruwaidiah Idris, "Effects of Rough Boundaries On Rayleigh-Bénard Convection in Nanofluids", Journal of Heat and Mass Transfer – Transactions of the ASME, vol. 145, no. 6, p. 062602, 2023. https://doi.org/10.1115/1.4056661.