INFORMATION ON DOCTORAL THESIS

1. Full name: **Nguyen Xuan Tu** 2. Sex: Male

3. Date of birth: 23/11/1982 4. Place of birth: Chi Lang – Lang Son

5. Admission decision number: 708/QĐ – ĐHSPHN2 .

6. Changes in academic process: None

7. Official thesis title: **LONG TIME BEHAVIOR AND CONTROL PROBLEM FOR SOME CLASSES OF STRONGLY DEGENERATE PARABOLIC EQUATIONS**

8. Major: **Mathematical Analysis** 9. Code: **9 46 01 02**

10. Supervisors: 1. Prof. PhD. Cung The Anh

2. PhD. Tran Van Bang

11. Summary of the new findings of the thesis

- Proving the existence and uniqueness of the weak solution, the existence of a global attractor for a class of semilinear parabolic equation involving the strongly degenerate operator Δ_λ on the bounded domain.

- Proving the existence and uniqueness of the weak solution, the existence of the global attractors for a class of semilinear parabolic equation involving the strongly degenerate operator $P_{s,\gamma}$ on $\mathbb{R}^N$.

- For the parabolic equation involving the strongly degenerate operator $P_{s,\gamma}$ in multi-dimensional case: We proved that the null controllability in any time $T>0$ holds when $s+\gamma \in \left(0, \frac{1}{2}\right)$(weak degeneracy). When $s=\gamma=\frac{1}{2}$ (strong degeneracy), we proved that the null controllability holds in large time. We have proved the null controllability in any time $T>0$ when $s+\gamma>1$ (too strong degeneracy).

12. Paratical applicability, if any: Thesis topic is topical, has scientific and practical significance.

13. Further research directions, if any:

- Study the properties of the global attractor obtained in Chapters 2 and 3, such as studying the smoothness of the attractor, evaluating the number of fractal dimensions, the continuous dependence on the parameter,...

- Study the existence and uniqueness of the weak solution, the existence of a global attractor for a class of semilinear parabolic equation involving the strongly degenerate operator Δ_λ on $\mathbb{R}^N$.

- Study the null controllability in the remaining cases of s and γ: Is it null controllable when $s+\gamma \in (1/2;1)$? Is it null controllable at large enough time, not null controllable at small time, when $s+\gamma = 1,\ s,\gamma \neq 1/2$?

14. Thesis-related publications:

[1] D.T. Quyet, L.T. Thuy and N.X. Tu (2017), "Semilinear Strongly Degenerate Parabolic Equations with a New Class of Nonlinearities", *Vietnam J. Math.* 45(3), 507-517.

[2] N.X. Tu (2021), "Global attractor for a semilinear strongly degenerate parabolic equation with exponential nonlinearity in unbounded domains", *Commun. Korean Math. Soc,* accepted

[3] C.T. Anh and N.X. Tu, "Null controllability of a strongly degenerate parabolic equation", submitted.

Date: 02/08/2021

On behalf of academic supervisors **PhD Student**

PhD. Tran Van Bang **Nguyen Xuan Tu**