

E. M. Varfolomeyev

On the Normality of Some Elliptic Functional Differential Operators

A field transformation in two-dimensional feedback in a nonlinear optical system leads to generation of multi-petal waves [1, 2]. The mathematical model of such a system is described by bifurcation of periodic solutions for quasi-linear parabolic functional differential equation with transformation of spatial variables $g(x)$. In [3, 4] this problem was considered in the case where the spatial domain Q is a circle or a ring and the transformation of spatial variables g is a rotation by some angle θ . An arbitrary domain $Q \subset \mathbb{R}^2$ and an arbitrary transformation g were considered in [5, 6]. In these works the linearized elliptic functional differential operator of the problem was assumed to be normal. In [7] necessary and sufficient conditions for the normality were obtained in terms of properties of domain $Q \subset \mathbb{R}^n$ and transformation g . A more general case without an assumption of normality was considered in [8].

In this work necessary and sufficient conditions for normality of the linearized operator were obtained in the case of two transformations of spatial variables.

References

- [1] Vorontsov, M. A., Ivanov, V.Yu., and Smalhausen, V.I. *Laser Optics in Condensed Matter*. Plenum Press, New York, 1988, 507–517.
- [2] Vorontsov M. A., Iroshnikov N. G., and Abernathy R. L. *Chaos, Solitons and Fractals*. 1994, **4**, 1701–1716.
- [3] Razgulin, A. V. *U.S.S.R. J. of Comput. Math. and Math. Physics*, 1993, **33**, **1**, 69–80; English trans. *Comp. Math. and Math. Physics*, Pergamon Press, Great Britain, 1993.
- [4] Razgulin, A. V. In *Chaos in Optics*, ed. Rajarshi Roy. *Proceedings SPIE*, 1993, **2039**, 342–352.
- [5] Skubachevskii, A. L. *Uspekhi Mat. Nauk*, 1996, **51**, 169–170; English trans. *Russian Math. Surveys*, 1996, **51**.
- [6] Skubachevskii, A. L. *Nonlinear Anal., Theory Methods Appl.*, Pergamon Press, Great Britain, 1998, **32**, No 2, 261–278.
- [7] Skubachevskii, A. L. *Funkts. Anal. Prilozh.*, 1997, **31**, No. 4, 60–65; English trans. *Funct. Anal. Appl.*, 1997, **31**.
- [8] Skubachevskii, A. L. *Differ. Uravn.*, 1998, **34**, No 10, 1394–1401; English trans. *Differ. Equations*, 1998, **34**.