ZAHID ISMAIL oglu KHALILOV

The outstanding scientist, honoured science worker, doctor of physical-mathematical sciences, academician Zahid Ismail oglu Khalilov will be 90. His life and creating activity is an example for the present and future generation Z.I. Khalilov was born on January 14, 1911 in Tbilisi city. He finished school and Pedagogical secondary school at the same city. After graduating from the mathematical faculty of Azerbaijan Pedagogical Institute he carried out scientific researches as an associate professor at Tbilisi Railway Transport Engineers Institute at first under the guidance of professor Stephan Bergman, then outstanding soviet mathematician academician N.I. Muskeleshvili. Moving to Baku in 1990 he worked at Azerbaijan State University as an associate professor. After two years Z.I. Khalilov was invited to Azerbaijan branch of USSR Academy of Sciences and he was the first scientist in mathematics in the department of physics. He created mathematics and physics department and led it.

Afterwards the present Institute of mathematics and Mechanics and Institute of Cybernetics of the Academy of Sciences were created on the basis of this department.

The importance of functional analysis in the theory of differential and integral equations was highly evaluated in the world and he was the author of the book on functional analysis in Russian. Then academician Z.I. Khalilov together with famous scientists of the world and the USSR becomes a member of editorial board of scientific journal "Functional Analysis and its Applications" from the first day of its creation. Applying the functional analysis methods acad. Z.I. Khalilov studied the abstract singular equations in abstract spaces of his name. He has written the monograph "Linear equations in normalized spaces" which gave rise to new scientific works in this field not only in Azerbaijan, and in many foreign countries.

Speaking about the application of functional analysis we have to remind a paper by acad. Khalilov "An optimal control of finite degree of freedom systems". Though a problem of the optimization of finite control parameters phenomena was well studied, the problems of optimal control of infinite number parameter phenomena was very difficult and still haven't been thouroughly studied.

Some scientific works done by acad. Zahid Khalilov in the field of mechanics have led to obtaining some significant scientific results. One of the properties of his activity is that acad. Z. Khalilov was closely engaged with the solution of applicable problems. Z. Khalilov's works devoted to the filtration theory rises oil mechanics field to a new stage.

Acad. Z. Khalilov for the first time has elaborated a difference method which is very important for mixed type equations in solving aerodynamics problems and by this work he has founded a basis for computational mathematics in Azerbaijan.

At the last years of his life he was intensively engaged with the application of contemporary algebraic and differential topology methods to the differential equations theory and he teached these methods to his followers in his seminars.

Acad. Z.Khalilov paid a great attention to the training of young generation of sciences. He has worked at Azerbaijan State University for a long time and played a great role in training high skill personnel.

Acad. Z.Khalilov had a great role in organization of science in Azerbaijan. For long years acad. Z.Khalilov was academic-secretary, vice president and President of Republican Academy of Science. Up to the last year of his life he was director of the Institute of Mathematics and Mechanics created by him. Z.Khalilov was a member of national committees of soviet mathematicians and mechanical engineers, a member of High Certificate Commission of the USSR, president of Azerbaijan Society of Mathematicians.

Outstanding scientist, a person of wide world outlooking, deep knowledge and organizational abilities Z.I. Khalilov will for ever live in the memory of science-lovers.

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MATHEMATICS

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BOUNDARY VALUE PROBLEMS AND OPTIMAL QUADRATURE FORMULAE

Abstract

Optimal quadrature formulae of S.M.Nokolski type are structured on the set of solutions of some boundary value problem. The nodes and coefficients of these quadrature formulae and their precise error have been found.

Consider the ordinary differential equation

$$y^{(2r)}(x)-\lambda y(x)=f(x) \tag{1}$$

under boundary conditions

$$y^{(\alpha_i)}(0)=y^{(\sigma_i)}(1)=0 \quad (i=0,1,...,r-1), \tag{2}$$

where $f(x)$ is a continuous function on the segment $[0,1]$, $\alpha_i<\alpha_{i+1}$, $\sigma_i<\sigma_{i+1}$ $(i=0,1,...,r-2)$ and $\alpha_i,\sigma_i\in\{0,1,...,2r-1\}$ $(i=0,1,...,r-1)$. Let $\lambda=0$ be not an eigen value of corresponding homogeneous problem.

Consider the differential equation (1) as functional on the space $L_p(0,1)$ functions $y(x)$, continuous on the segment $[0,1]$ with their derivatives up to order $2r$ includingly and satisfying the conditions (2).

By a class $C^{(2r)}L_p(0,1)$ we denote a set of solutions $y(x)$ of the boundary value problem (1), (2) for which

$$\|y(x)\|_{L_p(0,1)}=\left(\int_0^1|y(x)|^p dx\right)^{\frac{1}{p}}\le M, \quad (1\le p\le\infty). \tag{3}$$

Let for the totality on the segment $[0,1]$ continuous functions $f(x)$

$$\|f\|_{L_p(0,1)}=\left(\int_0^1|f(x)|^p dx\right)^{\frac{1}{p}}\le m, \quad (1\le p\le\infty).$$

In the present paper we find an optimal quadrature formula of the form

$$\int_0^1 y(x)dx=\sum_{k=1}^{N}\sum_{l=0}^{2r-2}A_n^{(l)}y^{(l)}(x_k)+R_N(f), \tag{4}$$

where $0<x_1<...<x_N<1$, for the class $C^{(2r)}L_p(0,1)$ $(1\le p\le\infty)$.

Theorem. *Among the quadrature formulae of the form (4) the unique formula determined by the coefficients*

$$A_k^{(2j+1)}=0, \quad (j=0,1,...,r-2)$$

$$A_k^{(2j)}=\frac{2h^{j+1}R_{q2r}^{(2r-2j+1)}(1)}{(2r)!}, \quad (j=0,1,...,r-1),$$

$$(-1)^l A_1^{(l)}=A_N^{(l)}=\frac{h^{l+1}}{(2r)!}\left\{\frac{(2r)!}{(l+1)!}\left[R_{q2r}(1)\right]^{\frac{l+1}{2r}}+(-1)^l R_{q2r}^{(2r-l+1)}(1)\right\},$$