Abstract

The paper is devoted to studying in $L_2[0;1]$ *the problem of* $k-$ *fold summability of expansions in a system of eigen functions of an irregular boundary value problem generated by the differential expression*

$$l(y,\lambda)=\sum_{i+j=n} p_i\lambda^i y^{(j)} \tag{1}$$

with the splitting boundary conditions

$$\begin{cases} u_i(y)\equiv y^{(\chi_i)}(\delta_i)=0, \\ \delta_i=0, \quad i=\overline{1,l}, \\ \delta_i=1, \quad i=\overline{l+1,n}, \\ 0\le\chi_1<...<\chi_l\le n-1 \\ 0\le\chi_{l+1}<...<\chi_n\le n-1 \end{cases} \tag{2}$$

where $p_i\in C \quad \left(\overline{0,n}\right), \quad p_0,\ p_n\neq 0,\ \sum_{i=1}^{n-1}|p_i|>0,\ \lambda$ *is a complex parameter.*

The problem on $k-$ *fold completeness* $(1\le k\le n)$ *of a system of eigen and adjoint functions (s.e.a.f)* $\{Y_i(x,\lambda)\}_{i=\overline{1,\infty}}$ *of the considered problems was studied in a number of papers, for example, in* [2] *, where it was shown that multiple completeness of s.e.a.f depends on the type of boundary conditions* (2) *and arrangement of the roots* k_i $\left(i=\overline{1,n}\right)$ *of a characteristic equation. The presence of multiple complete s.e.a.f makes urgent the problem on convergence of multiple expansions in Fourier series by this system for functions from the domain of definition of the operetor* L *generated by the problem* $(1)-(2)$ *. So, in* [3] *involving* $n-$ *fold complete s.e.a.f the problem on* $n-$ *fold summability of expansions for differential operetors of even and odd orders was studied in the case* $|2l-n|=0;1.$ *In* $[4;5]$ *similar problem was solved in the case* $2\le|2l-n|\le n-2.$

In the suggested paper we'll see how the problem on multiple summability of these expansions involving $k-$ *fold* $(1\le k\le 3)$ *complete in* $L_2[0;1]$ *s.e.a.f is solved for differential expressions of fourth order.*