Boundary value problems for the Schrrödinger equation

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The report is devoted to obtaining the necessary and sufficient conditions of the existence of solutions of the boundary value problem

$$\frac{d\varphi(t,\varepsilon)}{dt} = -iH(t)\varphi(t,\varepsilon) + \varepsilon Z(\varphi(t,\varepsilon),t,\varepsilon) + f(t), \tag{1}$$

$$l\varphi(\cdot,\varepsilon) = \alpha, \tag{2}$$

in the Hilbert space $\mathcal{H}$, where for any $t \in J \subset \mathbb{R}$ unbounded operator $H(t)$ has the form $H(t) = H_0 + V(t)$; here $H_0 = H_0^*$ is an unbounded selfadjoint operator with dense domain $D = D(H_0) \subset \mathcal{H}$; the mapping $t \to V(t)$ is strongly continuous. Boundary conditions can have the following form

$$a)\ l\varphi_0(\cdot) = \varphi_0(+\infty) - \varphi_0(-\infty) = \alpha;$$

$$b)\ l\varphi_0(\cdot) = \varphi_0(+\infty) - A\varphi_0(-\infty) = \alpha,$$

where l is a linear and bounded operator which translates the space $\mathcal{H}$ into the space $\mathcal{H}_1$, operator $A \in \mathcal{L}(\mathcal{H})$.

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1. Pokutnyi O. O. Boundary value problems for the evolution Schrödinger equation. – 2019, preprint.
2. Pokutnyi O. O. Boundary value problems for the evolution Schrödinger equation. I. Neliniini Kolyvannya (Nonlinear Oscillations), 2019, 22 (2), 235–249.