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Saddle Points of some Integral Functionals and Solutions of Elliptic Systems

We prove the existence of finite energy solutions u and ψ for two systems, one of which is

$$\begin{cases} u \in W_0^{1,2}(\Omega) : & -\operatorname{div}(a(x)\nabla u) = -\operatorname{div}(\psi E(x)), \\ \psi \in W_0^{1,p}(\Omega) : & -\operatorname{div}(a(x)|\nabla\psi|^{p-2}\nabla\psi) + E(x) \cdot \nabla u = f(x), \end{cases}$$

under some assumptions on p and on the vector field $E(x)$.

Keywords: Integral functions, saddle points, nonlinear elliptic equations.

MSC: 35J20, 35J47, 35J62.