The existence of the tensor method for the positive energy theorem (PET) proof in general relativity was unanimously declared impossible owing to existence of node points for Dirac equation in $\mathbb{R}^3$ or Sen-Witten equation on asymptotically flat manifolds. We give the correct tensor proof of the PET on the base developed by us a new approach for establishing the conditions of the Dirichlet problem solvability and zeros absence for general-covariant and locally $SU(2)$-covariant elliptic system of equations, which contains in particular case Dirac and Sen-Witten equation.

We obtain the new condition of the Dirichlet problem solvability and the condition of zeros absence for solutions of this general-covariant and locally $SU(2)$-covariant system

$$
\frac{1}{\sqrt{-h}} \frac{\partial}{\partial x^\alpha} \left( \sqrt{-h} h^{\alpha\beta} \frac{\partial}{\partial x^\beta} u_A \right) + C_A^B u_B = 0,
$$

where $h^{\alpha\beta}$ — components of the metric tensor in $V^3$; they are arbitrary real functions of independent real variables $x^\alpha$, continuous in $\Omega$ and the quadratic form $h^{\alpha\beta} \xi_\alpha \xi_\beta$ is negatively defined. The unknown functions $u_A$ of independent variables $x^\alpha$ are the elements of complex vector space $\mathbb{C}^2$, in which the skew symmetric tensor $\epsilon^{AB}$ is defined, and the group $SU(2)$ acts. $C_A^B$ is Hermitian $(1, 1)$ spinorial tensor.

On this basis we prove further that Sen-Witten equation have not node points if initial data set is asymptotically flat, dominant energy condition is fulfilled and at least one component of Sen-Witten spinor field asymptotically nowhere equals to zero.

Our work is next substantial argument after [1] in favour of geometrical nature of the Sen-Witten spinor field.

References