**Конференція молодих учених «Підстригачівські читання – 2015»,
26–28 травня 2015 р., Львів**

УДК 519.46:517.944

ON EXACT SOLUTIONS OF SOME LINEAR AND NON-LINEAR P(1,4)-INVARIANT D'ALEMBERT EQUATIONS

Volodymyr Fedorchuk

Pidstryhach Institute for Applied Problems of Mechanics and Mathematics of the National Academy of Sciences of Ukraine, volfed@gmail.com

Consider the following differential equations:

$$\Box_5 u = \lambda u, \lambda \in \mathbb{R}, \tag{1}$$

$$\Box_5 u = \sin u, \tag{2}$$

$$\Box_5 u = e^u, \tag{3}$$

$$\Box_5 u = \sinh u, \tag{4}$$

where $\Box_5 = \frac{\partial^2}{\partial x_0^2} - \frac{\partial^2}{\partial x_1^2} - \frac{\partial^2}{\partial x_2^2} - \frac{\partial^2}{\partial x_3^2} - \frac{\partial^2}{\partial x_4^2}$ is the d'Alembert operator in the five-dimensional Minkowski space M(1,4).

These equations are five-dimensional generalizations of ones, which have many applications in differential geometry, theory of nonlinear waves, theoretical and mathematical physics (see, e.g., [1-5]).

Equations (1)-(4) are invariant under the generalized Poincaré group P(1,4).

By now, using the subgroup structure of the group P(1,4) as well as invariants of its nonconjugate subgroups, we have performed the symmetry reduction for the above mentioned equations and constructed some classes of exact solutions for them.

Among these solutions there are:

- solutions with elementary functions,
- solutions with special functions,
- solutions with two arbitrary functions.

1. *Ablowitz M. J., Segur H.* Solitons and the Inverse Scattering Transform. – Philadelphia: SIAM Studies in Appl. Math., 1981. – 181 pp.
2. *Barbashov B. M., Nesterenko V. V.* Introduction to the Relativistic String Theory. – Singapore: World Sci., 1990. – 264 pp.

3. *Bhatnagar P. L.* Nonlinear Waves in One-Dimensional Dispersive Systems. – Oxford: Clarendon, 1979. – 142 pp.
4. *Kadyshevskii V. G.* A new approach to the theory of electromagnetic interactions // Fiz. Element. Chastits Atom. Yadra. – 1980. – № 1 – P. 5–39.
5. *Grundland A. M., Tuszyński J. A., and Winternitz P.* Group theory and solutions of classical field theories with polynomial nonlinearities // Found. Phys. – 1993. – № 4. – P. 633–665.

ПРО ТОЧНІ РОЗВ'ЯЗКИ ДЕЯКИХ ЛІНІЙНИХ ТА НЕЛІНІЙНИХ P(1,4)-ІНВАРІАНТНИХ РІВНЯНЬ Д'АЛАМБЕРА

Використовуючи підгрупову структуру групи Пуанкаре P(1,4) проведено симетрійну редукцію деяких P(1,4)-інваріантних рівнянь Д'Аламбера та побудовано деякі класи їх точних розв'язків.