

$$\times \frac{1}{R_1'} J_0 \left( \frac{2\omega r' (t-\tau)}{R_1'} - \frac{4\omega^2}{R_1'} F_{3z}' \int_0^{t-\tau} J_0 \left( \frac{2\omega r' \tau'}{R_1'} \right) d\tau' \right) d\tau d\bar{x}' d\bar{y}' d\bar{z}'. \quad (10)$$

Turning to the initial coordinate system from formulas (5) and (6), let us note that due to the orthogonality of the coordinate transformation

$$\Delta_1 = \Delta, \quad R_1' = R_1, \quad d\bar{x}' d\bar{y}' d\bar{z}' = d\bar{x} d\bar{y} d\bar{z},$$

however,  $r'^2 = R'^2 - (z' - \bar{z}')^2 = (x' - \bar{x}')^2 + (y' - \bar{y}')^2 \sin^2 \varphi + (z' - \bar{z}')^2 \cos^2 \varphi \equiv S_1^2,$

$$\frac{\partial}{\partial x'} = \frac{\partial}{\partial x}; \quad \frac{\partial}{\partial y'} = \sin \varphi \frac{\partial}{\partial y} - \cos \varphi \frac{\partial}{\partial z}; \quad \frac{\partial}{\partial z'} = \cos \varphi \frac{\partial}{\partial y} + \sin \varphi \frac{\partial}{\partial z},$$

$$F_1' = F_1; \quad F_2' = F_2 \sin \varphi - F_3 \cos \varphi; \quad F_3' = F_2 \cos \varphi + F_3 \sin \varphi,$$

where  $F_1, F_2$  and  $F_3$  are equal, respectively, to the right sides of equations (7) with the elimination of primes on all letters.

Then,

$$\begin{aligned} Q = & -\frac{1}{4\pi} \iiint_{-\infty}^{+\infty} \left[ \Delta Q \frac{1}{R_1} J_0 \left( \frac{2\omega S_1}{R_1} t \right) + \Delta Q_t \frac{1}{R_1} \int_0^t J_0 \left( \frac{2\omega S_1}{R_1} \tau \right) d\tau \right] dx' dy' dz' + \\ & + \iiint_{-\infty}^{+\infty} \left\{ [-(F_{1x} + F_{2y} + F_{3z})] \frac{1}{R_1} \frac{\partial}{\partial t} J_0 \left( \frac{2\omega S_1}{R_1} (t-\tau) \right) + \right. \\ & + 2\omega [\sin \varphi (F_{1y} - F_{2x}) - \cos \varphi (F_{1z} - F_{3z})] \frac{1}{R_1} J_0 \left( \frac{2\omega S_1}{R_1} (t-\tau) \right) - \\ & \left. - \frac{4\omega^2}{R_1} [F_{2y} \cos^2 \varphi + (F_{2z} - F_{3y}) \sin \varphi \cos \varphi + F_{3z} \sin^2 \varphi] \times \right. \\ & \left. \times \int_0^{t-\tau} J_0 \left( \frac{2\omega S_1}{R_1} \tau' \right) d\tau' \right\} d\tau dx' dy' dz'. \quad (11) \end{aligned}$$

When solving the problem for a half-space we will consider that when  $z = 0, \varphi_z = 0$ . Separating in (11) the integrals which are functions of  $z$  and  $z'$ , we can represent them thus:

$$\int_{-\infty}^{\infty} \varphi(z') \psi [(z-z')^2] dz' = \int_0^{\infty} \{ \varphi(z') \psi [(z-z')^2] + \varphi(-z') \psi [(z+z')^2] \} dz',$$

requiring that

$$\begin{aligned} \frac{\partial}{\partial z} \int_0^{\infty} \{ \varphi(z') \psi [(z-z')^2] + \varphi(-z') \psi [(z+z')^2] \} dz' = \\ = \int_0^{\infty} \{ \varphi(z') \psi'(z'^2) 2(-z') + \varphi(-z') \psi'(z'^2) 2z' \} dz' = 0, \end{aligned}$$

we have  $-\varphi(z') + \varphi(-z') = 0$ , i.e.,

$$\varphi(-z') = \varphi(z').$$

This indicates that for a half-space in formula (11) we should consider the integrals of the examined type equal to

$$\int_{-\infty}^{\infty} \varphi(z') \psi [(z-z')^2] dz' = \int_0^{\infty} \varphi(z') \{ \psi [(z-z')^2] + \psi [(z+z')^2] \} dz'.$$