ON THE DIFFERENTIAL EQUATIONS OF HILL IN THE THEORY OF THE MOTION OF THE MOON (II)

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1. In a former paper with the same title[1] (quoted below as "I") polar coordinates r and l were employed to represent the orbit, and power series in $x \equiv \cos 2l$ were used for satisfying the differential equations. In the present paper the time t will be employed as independent variable, and the expansions will be in powers of t or some simple function of t.

We put in I (4)

$$\cos 2l = x, \qquad \sin 2l = y, \qquad \varepsilon = \xi + \tfrac{1}{2} \tag{1}$$

so that

$$\frac{dx}{dl} = -2y, \qquad \frac{dy}{dl} = 2x, \qquad x^2 + y^2 = 1 \tag{2}$$

and find, taking I (3) into account, the following system of equations[2]

$$\frac{d\varrho}{dt} = \omega^2 - \varrho^2 - \xi + \frac{3}{2}x \tag{3}$$

$$\frac{d\omega}{dt} = -2\varrho\omega - \frac{3}{2}y \tag{4}$$

$$\frac{d\xi}{dt} = -3\varrho\xi - \frac{3}{2}\varrho \tag{5}$$

$$\frac{dx}{dt} = -2y\omega + 2y \tag{6}$$

$$\frac{dy}{dt} = 2x\omega - 2x. \tag{7}$$

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[1] *Acta mathematica*, 93 (1955), 169–177.

[2] The possibility of reducing to this form was, in principle, already indicated in my thesis *Analytiske Studier med Anvendelser paa Taltheorien*, Copenhagen 1912, p. 146–147.