MR2891304 (Review) 34G10 (34A45 35K90 41A20 47D03)

Vitásek, Emil (CZ-AOS)

Approximate solution of an inhomogeneous abstract differential equation. (English summary)

Appl. Math. **57** (2012), *no. 1,* 31–41.1572-9109

Let X be a (complex) Banach space and let A be the infinitesimal generator of a C_0-semigroup of operators $U(t)$, $0 \leq t \leq T$. Recently the author dealt with the abstract Cauchy problem

$$\begin{cases} u'(t) = Au(t), & t \in [0,T]; \\ u(0) = \eta, \end{cases}$$

$\eta \in X$, approximating the solution directly using a rational function F which approximates the exponential function of order p, i.e.,

$$\exp(z) = F(z) + O(z^{p+1}) \quad \text{for } z \to 0,$$

p being a positive integer [see E. Vitásek, Appl. Math. **52** (2007), no. 2, 171–183; MR2305871 (2007m:34134)].

The aim of this paper is to extend the results contained in [op. cit.] to the inhomogeneous case, that is, to the problem

$$\begin{cases} u'(t) = Au(t) + f(t), & t \in [0,T]; \\ u(0) = \eta, \end{cases} \tag{1}$$

where $f\colon [0,T] \to X$ is a continuous function. Applying the so-called *selfstarting block method*, the author constructs a suitable rational function F and states a convergence theorem for the approximation of the solution to problem (1).

Reviewed by *Vita Leonessa*

References

1. *N. Dunford, J. T. Schwartz*: Linear Operators. 1. General Theory. Interscience Publishers, New York-London, 1958. MR0117523 (22 #8302)
2. *T. Kato*: Perturbation Theory for Linear Operators. Springer, Berlin-Heidelberg-New York, 1966. MR0203473 (34 #3324)
3. *M. Práger, J. Taufer, E. Vitásek*: Overimplicit multistep methods. Apl. Math. *18* (1973), 399–421. MR0366041 (51 #2292)
4. *A. E. Taylor*: Introduction to Functional Analysis. John Wiley & Sons, New York, 1958. MR0098966 (20 #5411)
5. *E. Vitásek*: Approximate solutions of abstract differential equations. Appl. Math. *52* (2007), 171–183. MR2305871 (2007m:34134)
6. *K. Yosida*: Functional Analysis. Springer, Berlin-Heidelberg-New York, 1971. MR0617913 (82i:46002)