BULL. AUSTRAL. MATH. SOC. 46F99, 42A84
VOL. 10 (1974), 311-312.

Abstracts of Australasian PhD theses

Almost periodic generalized functions

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The content of the thesis was the definition of some new classes of almost periodic generalized functions, and a study of their properties. These classes were shown to be the natural generalized-function analogues of Besicovitch's classes of almost periodic functions.

We began by showing how spaces of almost periodic functions can, in a natural way, be considered as linear subspaces of a space T^*, which was defined to be the algebraic dual space of the space T of trigonometric polynomials. Furthermore, all the usual operators on the spaces of almost periodic functions were shown to be restrictions of operators on T^*.

By equipping the space T with various topologies, and considering the resultant (continuous) dual spaces, further subspaces of T^* were defined. Representation theorems were then proved which show that these latter subspaces of T^* satisfy the criteria to be called spaces of almost periodic generalized functions. In particular, they contain all (generalized) derivatives of almost periodic functions. In a related way, we were able to define spaces of almost periodic differentiable functions.

The main properties of these new spaces were then established. The elements of the spaces were shown to have typically 'almost periodic' properties, such as normality, approximation by trigonometric polynomials, and the relative density of translation numbers. The nature of the duals of our spaces, and other general properties, such as completeness, were investigated.

We then studied the properties of some special operators on the

Received 28 November 1973. Thesis submitted to the University of Melbourne, July 1973. Degree approved, November 1973. Supervisor: Dr B. D. Craven.

spaces; in particular, their continuity. In a section on multiplication, we arrived at generalized forms of the Parseval equation and the Riesz-Fischer-Besicovitch Theorem. The final chapter was a brief study centred about the concept of convolution. With the introduction of this operation, our spaces become topological algebras. Some results were given concerning the structure of these algebras, and we also touched on some 'multiplier' theory.