A MATRIX METHOD FOR SOLVING THE POSTAGE STAMPS PROBLEM

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Dedicated to the memory of Professor C. H. Teng

1. **Introduction.** In several recent papers Gilder [1] and Planitz [2] considered the problem of purchasing postage stamps of various denominations so as to meet a fixed budget. If there are n types of stamps this requires the solution of the equation

$$a_1x_1 + a_2x_2 + \cdots + a_nx_n = c \tag{1.1}$$

where a_i is the cost of the ith type of stamp, x_i is the number of stamps and c is the budget, where x_i and a_i are non-negative integers. In [1] Gilder discusses the solution in integers of the equation

$$12x_1 + 17x_2 = 100z \ , \tag{1.2}$$

where x_1 is the number of second class stamps (at the old rate of $12p$), x_2 the number of first class stamps (at $17p$), and z the total cost in pounds. Planitz extends the problem by shopping for three types of stamps giving the equation

$$13x_1 + 18x_2 + 22x_3 = c \ . \tag{1.3}$$

Solving (1.2) is a classical problem in diophantine equations provided that the x_i are unrestricted. The novelty of the postage stamp problem lies in the fact that the solution x_i must be non-negative.

To solve (1.2) Gilder [1] and Planitz [2] use the known continued fraction solution for (1.1) for $n = 2$ to generate all integer solutions. The non-negative ones are then obtained