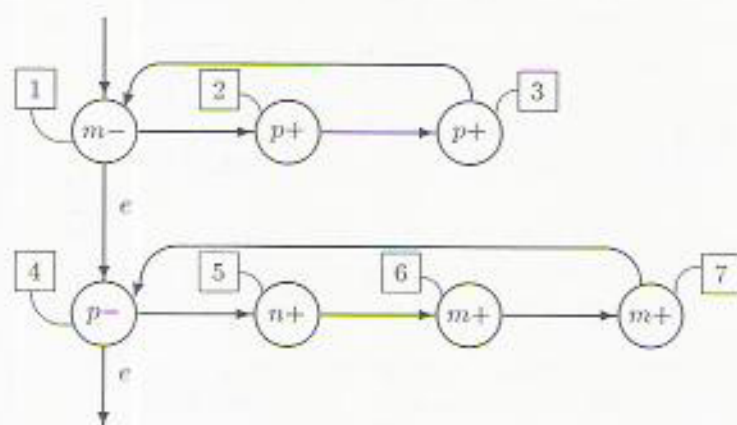


Mathematical Logic

Question 5 (Unit 2) - 10 marks

This question concerns the abacus machine whose flow chart is shown below.



- (i) Write down the trace table for the computation of this machine when initially the contents of the registers are

$$[m] = 1, \quad [n] = 2, \quad [p] = 1. \quad [4]$$

- (ii) Suppose that m , n and p initially contain respectively the first, second and third arguments of a function f , and that the value of f is given by the content of register n when the computation halts.

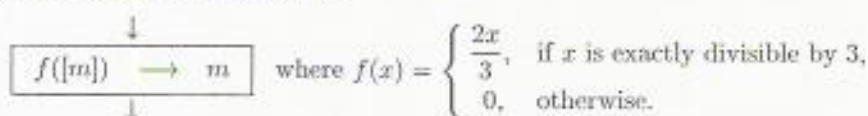
(a) Write down a formula which describes the rule of f . [2]

(b) How are the final contents of registers m and p related to the initial contents of the three registers? [4]

Question 6 (Unit 2) - 10 marks

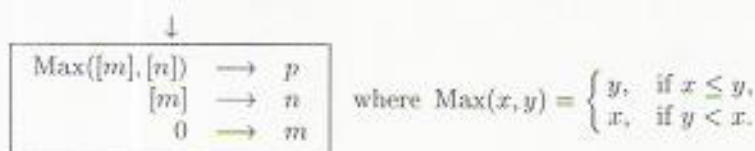
In both parts of this question you may use extra registers besides the ones mentioned, if you so wish.

- (i) Give in full the flow chart of an abacus machine program which has the effect shown in the following diagram.



[5]

- (ii) Give in full the flow chart of an abacus machine program which has the effect shown in the following diagram.



Assume that $[p] = 0$ initially.

$$\text{Max}(m, n) = n \text{ if } m \leq n \\ = m \text{ if } n < m$$