HW2 (*due 4 April 2023 Tuesday before recitation)*

1- *State the Turing Machines in the tabular format discussed in class and lecture notes that implement the following* ***RATM*** *statements :*
(a) *add =c ;* ***(b)*** *jpos s* ***; (c)*** *sub j*

2- *Assuming a 2 tape TM that multiplies the binary coded positive integers in tapes 1 and 2 and writes the result in tape 1 is available and is named as* ***MULT*** *; construct in tabular format a multitape , nondeterministic TM that* ***decides*** *whether a given binary coded integer is a prime number making use of the TM* ***MULT****.*

3- *Problems from the main text book (note the word accepts means semidecides in our class terminology): 4.5.1, 4.5.2*

4- *Let* M_1 *and* M_2 *be single tape DTMs that decide the languages* L_1 *and* L_2 *respectively . Construct using a tabular format a 2-tape NDTM* M *that decides the language* $L_1.L_2$ *. (Assume : (i) that both* M_1 *and* M_2 *decide* L_1 *and* L_2 *leaving the tape contents clean, namely with* $(h_{YES}, \Diamond \underline{\#})$ *or* $(h_{NO}, \Diamond \underline{\#})$ *final configurations ; (ii) if* X *and* Y *are DTMs that* ***decide*** *languages then* $X.Y$ *is defined as the* ***sequential composition*** *where control passes from* X *to* Y ***iff*** X *reaches the state* h_{YES} *.)*

5- *If* M *is a TM that decides the language* L *where the assumptions of question 4 hold, construct using a tabular format a 2-tape NDTM* M' *that decides the language* L^* *.*