



alphabet:  $\{\Delta, a, b\}$

States:  $\{A, B, C, D, E, F, G, R\}$

Starting:  $\{A\}$

Explanation: I designed a TM which can insert and delete cells. Insertion example;  $\Delta \underline{a} b a b$  turns into  $\Delta \underline{w} a b a b$ . Deletion example;  $\Delta \underline{a} b a b$  turns into  $\Delta \underline{b} a b$ . This machine can be used as smaller part of another Turing machine. This gives that TM to insert or delete cells.

Göktaş 2000

2380343

(i) Yes, it has an equivalent power compared to standard Turing machines.

Design above proves the answer. Since the design above is a standard Turing machine and can do insert and delete when it is used as a smaller piece of a bigger TM. This shows an equivalence in power.

b) I know that recursive languages are not closed only on homomorphism and substitution. For other operations, Recursive Languages are closed, but I cannot prove that. Thank you for your attention. :(