Homework #8 *due December 30, 2016, Friday*

Question 1
Give a state-input tabular description of a *TM* that realizes the following computation :
(s, $\underline{\#}u$) \|---*$_M$ (h, $\underline{\#}v$); $u \in (0+1)^*$ and ***v*** is obtained from ***u*** by interchanging ***0***s and ***1***s

Question 2
Describe a *TM* ***M*** in both graphical and compositional tabular forms that *decides* the language
$L = \{u \in \Sigma_0^* \mid u = u^R\}$
(*Hint : you may use an extra symbol* ***$ \notin \Sigma_0$*** and choose as initial *ID* : ***(s, $\underline{\#}u$))***

Question 3
Describe a TM ***M*** in both graphical and compositional tabular forms that performs the following computation :
(s, $w$$\underline{\#}$) \|---*$_M$ (h, $u$$\underline{\#}$)
where ***u*** is obtained from ***w*** by compressing all blank (#) symbols in ***w*** and ***$*** is a special symbol not used in ***w***.

Question 4
Construct a *TM* ***M*** (***multitape*** *and/or* ***nondeterministic*** *if necessary!)* that decides the language below (*specify the TM in tabular compositional form)*.
$L_n = \{\omega \in (a+b)^* \mid w = u^n , u \in (a+b)^*,$ n *a fixed positive integer****)***
(*Hint : you may use induction on* ***n****)*

Question 5
Construct *TMs* in compositional tabular forms (***multitape*** *and/or* ***nondeterministic*** *if necessary!)* that perform the following computations :
(i) ***(s, $\underline{\#}w$) \|---*$_M$ (h, $\underline{\#}w\#w$)***
(ii) ***(s, $\underline{\#}w$) \|---*$_M$ (h, $\underline{\#}w^R$)***
(iii) ***(s, $\underline{\#}w$) \|---*$_M$ (h, $\underline{\#}ww$)***
(iv) ***(s, $\underline{\#}w$) \|---*$_M$ (h, $\underline{\#}w\#w^R$)***
(v) ***(s, $\underline{\#}w$) \|---*$_M$ (h, $\underline{\#}a^n b^n$)*** *where the number of* ***a****s and* ***b****s in* ***w*** *are both equal to* ***n*** .