形式化作业：

1. 设计一个图灵机可以接受 $L = \{a^i b^j c^k \mid i,j,k \geq 1, i = j+k\}$

$M = (Q, \{a,b,c\}, \{a,b,c,X,Y,Z\}, \delta, q_0, B, F)$

读取 a，替换为 X，右移直到遇到 b

读取 b，替换为 y，左移直到遇到 X

匹配 a, b，直到所有 b 都被 y 替换并遇到 c

读取 c 并将其替换为 Z，左移直到遇见 X

再匹配 a, c，直到所有 a 都替换为 X

如果所有 c 都替换为 Z，则接受

验证 $aaabcc$

$q_0 aaabcc \vdash X q_1 aabcc \vdash Xa q_1 abcc \vdash Xaa q_1 bcc \vdash Xa q_2 aYcc$

$\vdash X q_2 aaYcc \vdash q_2 XaaYcc \vdash X q_0 aaYcc \vdash XX q_1 aYcc \vdash XXa q_1 Ycc$

$\vdash XXa Y q_3 cc \vdash XXa q_4 YZc \vdash XX q_4 aYZc \vdash X q_4 XaYZc \vdash XX q_0 aYZc$

$\vdash XXX q_1 XYZc \vdash XXXY q_3 Zc \vdash XXXYZ q_5 c \vdash XXXY q_4 ZZ \vdash XXX q_4 YZZ$

$\vdash XX q_4 XYZZ \vdash XXX q_0 YZZ \vdash XXXY q_6 ZZ \vdash XXXYZ q_7 Z \vdash XXXYZZ q_7 B$

$\vdash XXXYZZB q_8$

接受

2. 设计图灵机 求两个整数的最大公约数

$M = (Q, \{0\}, \Gamma_1, \Gamma_2, \delta, q_0, B, F)$，$Q = \{q_0, q_1, q_2, q_3, p\}$

$\delta(q_0, 0, 0) = (q_0, 0, 0, R, R)$

$\delta(q_0, B, 0) = (q_1, B, 0, L, L)$

$\delta(q_0, 0, B) = (q_2, 0, B, L, L)$

$\delta(q_0, B, B) = (p, B, B, S, S)$

$\delta(q_1, 0, 0) = (q_1, 0, B, L, L)$

$\delta(q_1, B, B) = (q_3, B, B, R, R)$

$\delta(q_2, B, B) = (q_3, B, B, R, R)$

$\delta(q_3, 0, B) = (q_3, 0, B, S, R)$

$\delta(q_3, B, 0) = (q_3, B, 0, R, S)$

$\delta(q_3, 0, 0) = (q_0, 0, 0, S, S)$