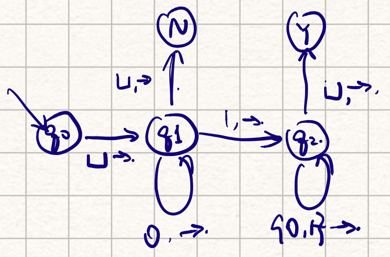
1. a. i) decidable reach halting state
$s \in L$ accepts
$s \notin L$ rejects

recognisable only $s \in L$ reach a halting state.
and accepts
for $s \notin L$ could loop/ reach reject state

(ii).



Q — $\{q_0\ q_1 q_2\}$ Y,N.

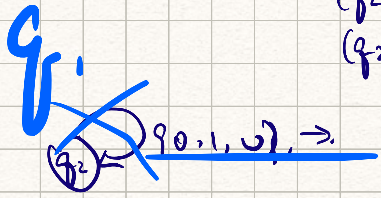
Σ — {1,0} ▷ ⊔

q_0

H ↓ {Y, N}.

δ.

$(q_0, ⊔, q_1, \rightarrow)$,
$(q_1, 0, q_1 \rightarrow)$
$(q_1, ⊔, N, \rightarrow)$
$(q_1, 1, q_2, \rightarrow)$
$(q_2, 0, q_2 \rightarrow)$
$(q_2, 1, q_2 \rightarrow)$
$(q_2, ⊔, Y, \rightarrow)$



b.

L_1	unrecog.	doesn't apply.
L_2.	recog.	apply.
L_3.	recog.	apply
L_4.	recog	doesn't apply
L_5.	non-recog.	apply

c.

$\langle y, x\rangle. \rightarrow f(\langle y, x\rangle)$. $\overset{\text{non-decidable}}{HALT} \in L$. — non-decidable

if $y = code(M)$ → $f(\langle y, x\rangle) = code(M')$. on input code(M')
M' → clears the tape.
→ writes x on tape and run M
otherwise loop.

halts in $\langle M,x\rangle$.

if $y \neq code(M)$. → then $f(\langle y,x\rangle) = y \neq L$.

L^-

$HALT \leq L$. L is undecidable.

recognisable. L^- is undecidable.

⇕.

$HALT^- \leq L^-$ L^- is unrecognisable.

for graph G, exist path cycle C= {v0…vn},
where ICI = IVI, (v0,v1),(v1,v2)…(vn,v0) \in E

2. (a). HCP. is find a path cycle
that visits all node exactly once

(b) x. f, k. $f: (n_0, n_1) \to N$
$x \times x \to N$. $k \in N$

1. $(0, 1, 3, 2)$
$2 \times 0 \times 1 \times 3 = 0$ $k = 0$

2. $(0, 1, 2, 3) \to 2 \times 1 \times 4 \times 2 = 16$

$(0, 3, 1, 2) \to 2 \times 3 \times 1 \times 5 = 30$

$0, 3, 2, 1$ $2 \times 4 \times 1 \times 2 = 16$

$k = 16$

$$\log_2 |X| + |X|^2 \times \log_2 m + \log_2 k$$

1+..(lxl-1)= lxl*(lxl-1)/2*log2(m)

$A \leq_p B$, $B \leq_p C$.

let T_0 be a p-time with $f_{T_0}(a) = b$.

T_0 — — $f_{T_1}(b) = c$.

$f_{T_1}(f_{T_0}(a)) = c$. $A \leq_p C$.

p-time.

```
MCP.
pick a $x$
path = $\{x\}$.

  while $|path| < |X|$
        pick $w \in X \setminus path$,
        append $w$ to path

  Calculate $S = f(x_0, x_1)$ - - - in path. determin $S \leq k$
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S= f(x0,x1) *…. * f(xn, x0)

HCP $\leq_p$ MCP

∫. MCP is also NPC.

HCP p-time reduce to MCP

So HCP connects a graph, the limitation being if a edge belongs to E
MCP gurantees any edge, but the limitation being the mutliplication sum

Assume HCP G(V,E), for every edge in E, convert its weight to 1
for every edge not in E, convert its weight to 2
MCP(G’, 1)