

SAMPLE

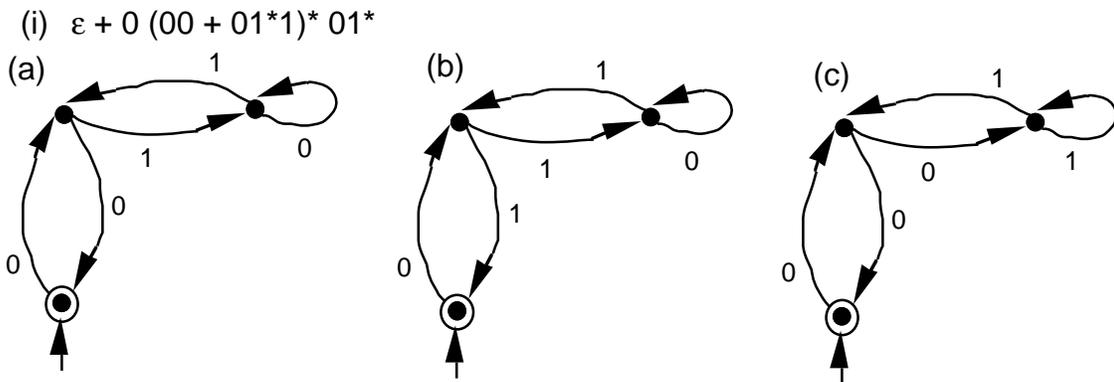
Exam I Open book/notes

1. 20 [points]

Provide a regular expression describing *all* sequences ($\Sigma = \{0,1\}$) that do not contain 01 as a subsequence, and justify your answer.

2. [30 points]

Match each NFA with an equivalent regular expression selected from (i) – (iv). No justification is required.



- (ii) $\epsilon + 0(00 + 10^*1)^* 0$
(iii) $\epsilon + 0(00 + 01^*1)^* 0$
(iv) $\epsilon + 0(10 + 10^*1)^* 1$

3. [30 points]

Determine whether or not $\{0^p 1^q \mid p, q \geq 0 \text{ and } 2p > 3q\}$ is regular and prove your answer.

4. [20 points]

One of the following functions $f: \{0,1\}^* \rightarrow \{0,1\}^*$ is extendible and of finite index (i.e., can be realized with a DGSM) and one is not. Which is which, and why?

- (a) for each $x \in \{0,1\}^*$, $f(x)$ is x with all instances of '1' deleted
(b) $f(\epsilon) = \epsilon$, and for each $x \in \{0,1\}^*$ and $\lambda \in \{0,1\}$, $f(x\lambda) = f(x) x\lambda$,