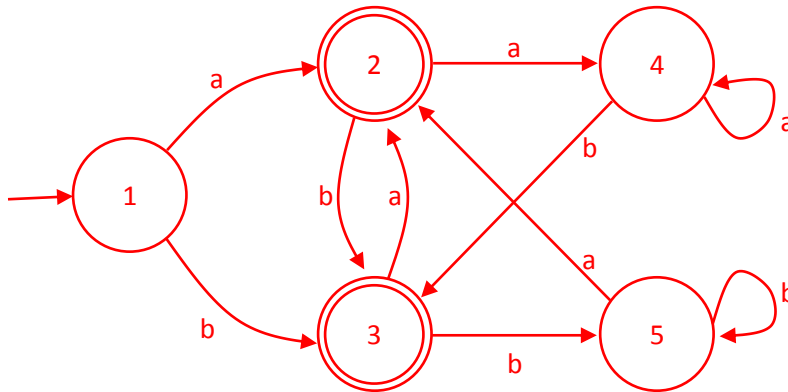


Student ID :
Name-Surname :

Theory of Computation midterm exam (2017-2018 Fall)

(Please use free space for draft and fit your answer to boxes.)

1. (25P) Assume that a light sensor can produce a value between [0 100]. If the measured enlightenment is less than X value (like 10), the system know that it is night-time, otherwise it is day-time. By using this light sensor with a computer, it is wanted to determine day-night and night-day transitions. Prepare a DFA simulation of the problem, which ensures that the system works correctly no matter what time the system is first started (day or night). (All other representations can be defined as desired)



a: the measured enlightenment is less than the threshold value (it is dark)
b: the measured enlightenment is greater or equal to the threshold value (it is light)
state 1: any-time
state 2: day-night transition
state 3: night-day transition
state 4: night-time
state 5: day-time

2. (25P) Language A's syllables can include one vowel only or vowel+consonant or consonant+vowel or consonant+vowel+consonant. If we have $\Sigma=\{a, b\}$, write regular expression of A's words.

$(a|ba|ab|bab)(a|ba|ab|bab)^*$

3. (25P) Assume that Turkish sentences starts with noun-word and can goes on with one blank symbol (#) and then one verb-word. Each noun and also verb in Turkish can include many syllables which can be "ab" or "ba" or "bab". If we have $\Sigma=\{a, b, \#\}$, write Context Free Grammar of Turkish sentences.

$S \rightarrow N \mid N\#V$
 $N \rightarrow ab \mid ba \mid bab$
 $V \rightarrow ab \mid ba \mid bab$

S (Sentence) is start variable
N (Noun word)
V (Verb word)

4. (25P) Design a PDA (Push Down Automaton) that accepts b^*ab^* . ($\Sigma=\{a, b\}$)

$q_1a\$ \rightarrow q_2R\$$
 $q_2b\$ \rightarrow q_1R\$$
 $q_1\#\$ \rightarrow q_1N\$$ reject with loop forever

 $q_2a\$ \rightarrow q_2N\$$ reject with loop forever
 $q_2b\$ \rightarrow q_2R\$$
 $q_2\#\$ \rightarrow q_2N\epsilon$ accept