Set-1

20pts. 1. use Proper English to describe the following regular language

i $(a|b|c)^* (bbb|ccc) (a|b|c)^*$

The Set of string over $\{a,b,c\}$ that Contain atleast one 'bbb' or 'ccc'

ii $(a|b)^* (c(a|b)^* c (a|b)^*)^* ccc$

The set of strings over $\{a,b,c\}$ that Contain odd number of c's with Minimum of 3c's and ending with ccc

30pts 2. Assume $\Sigma = \{a,b,c\}$ write regular Expression for the following:

i ~~a|c~~ All strings over $\{a,b,c\}$ that Contain no bb's

$(a|c)^* \mid (a|c)^* (b|(a|c)^+) b (a|c)^*$

ii All strings of digits such that all the 2's & 3's occur after all the 8's and 9's

$(0|1|4|5|6|7|8|9)^* (0|1|2|3|4|5|6|7)^*$

iii All strings over $\{a,b,c\}$ in which the number of b's plus the number of c's is 5

$a^* (b|c) a^* (b|c) a^* (b|c) a^* (b|c) a^* (b|c) a^*$

30pts

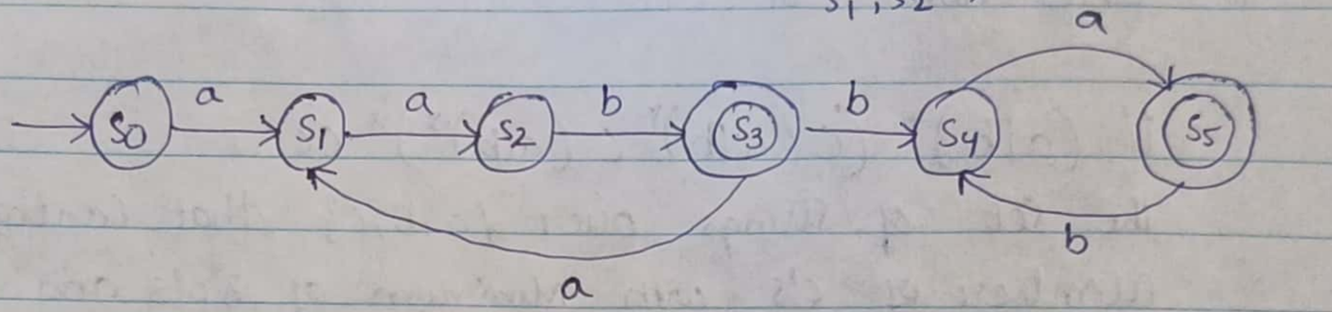
3. Construct DFA without ε-transition for the following regular language

$S_3, S_5 \rightarrow$ final states

i $(aab)^+ (ba)^*$

$S_0 \rightarrow$ Initial states

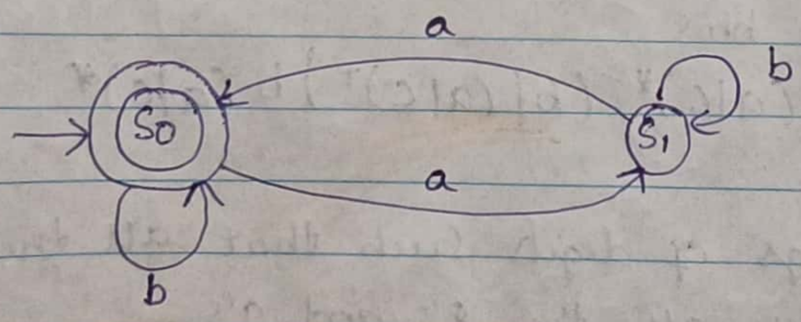
$S_1, S_2 \rightarrow$ Intermediate state



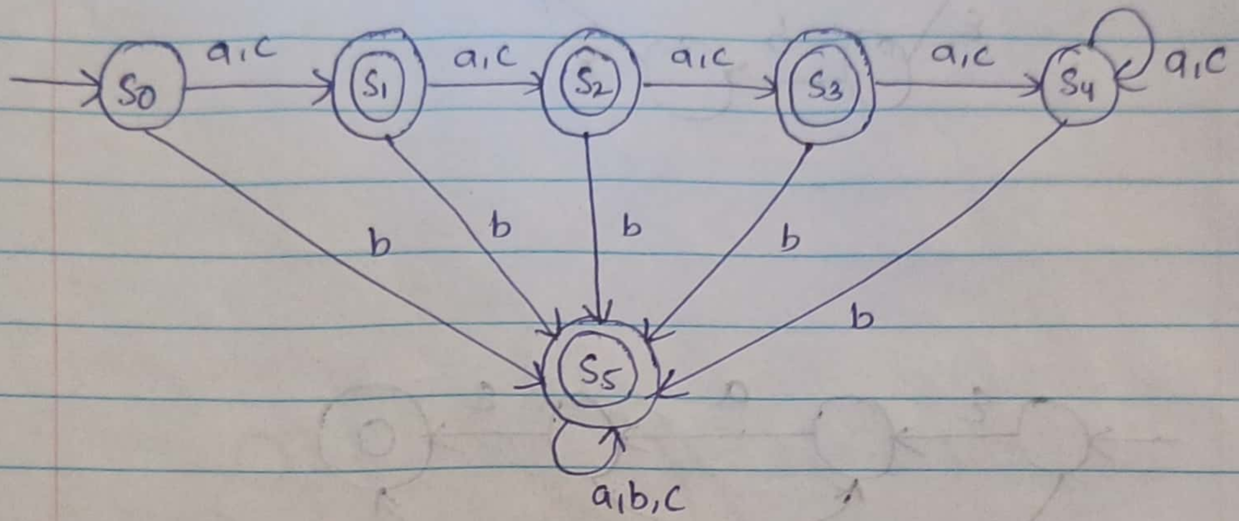
ii The set of strings over {a,b} in which the number of a's is even

$ab^* \; ab^*$

a's is even



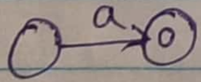
ii(B) The set of strings over $\{a, b, c\}$ which contain at least one b if its length is greather than(>) 4



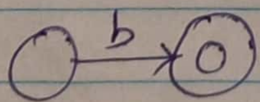
10pts 3) According to the Thompsons Construction, Construct an NFA from the regular expression

$aa\,(a|b|c)^*\,bb$

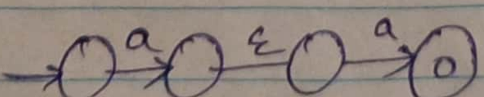
a →



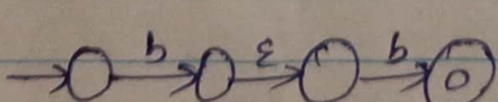
b →



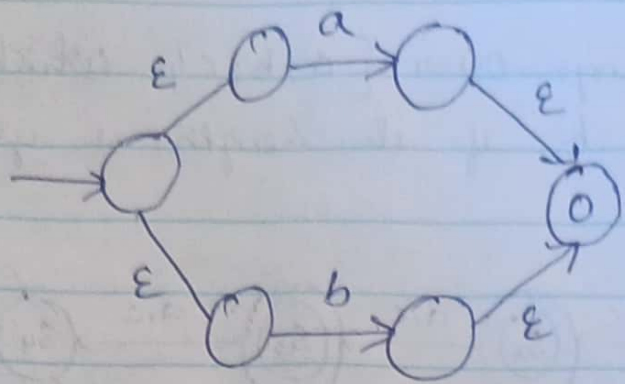
aa →



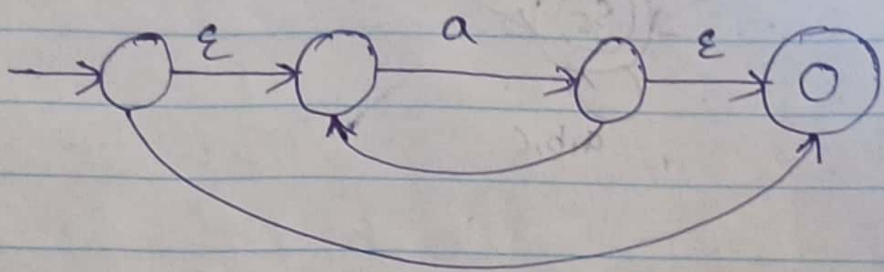
bb →



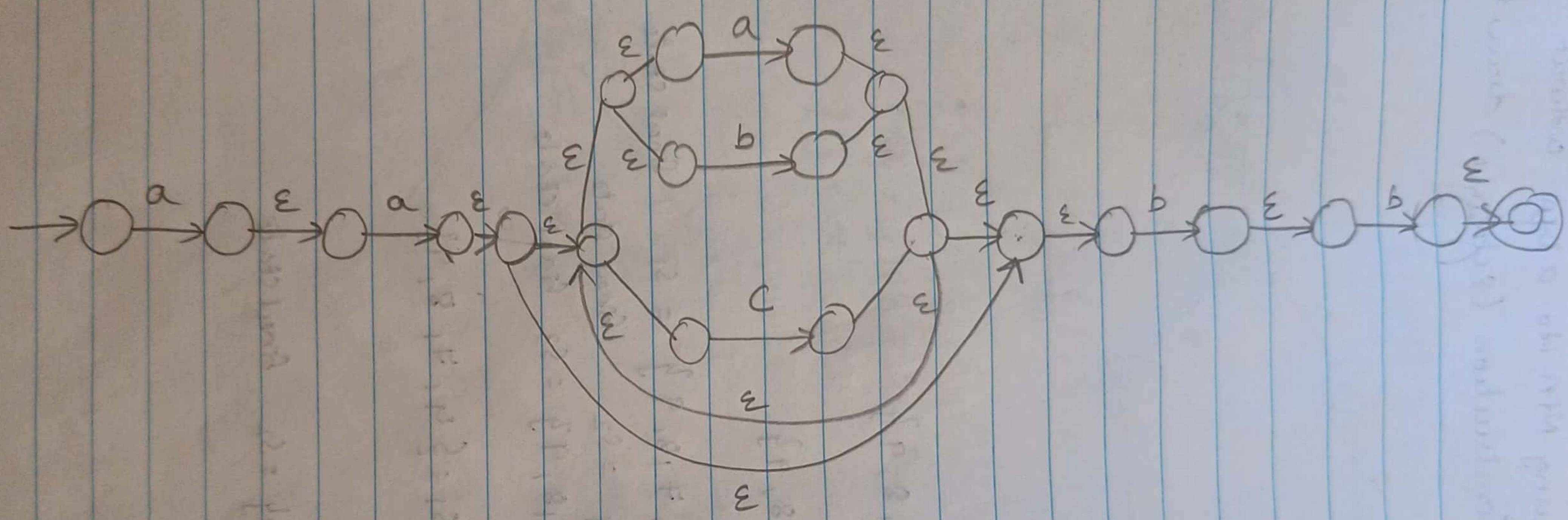
a|b



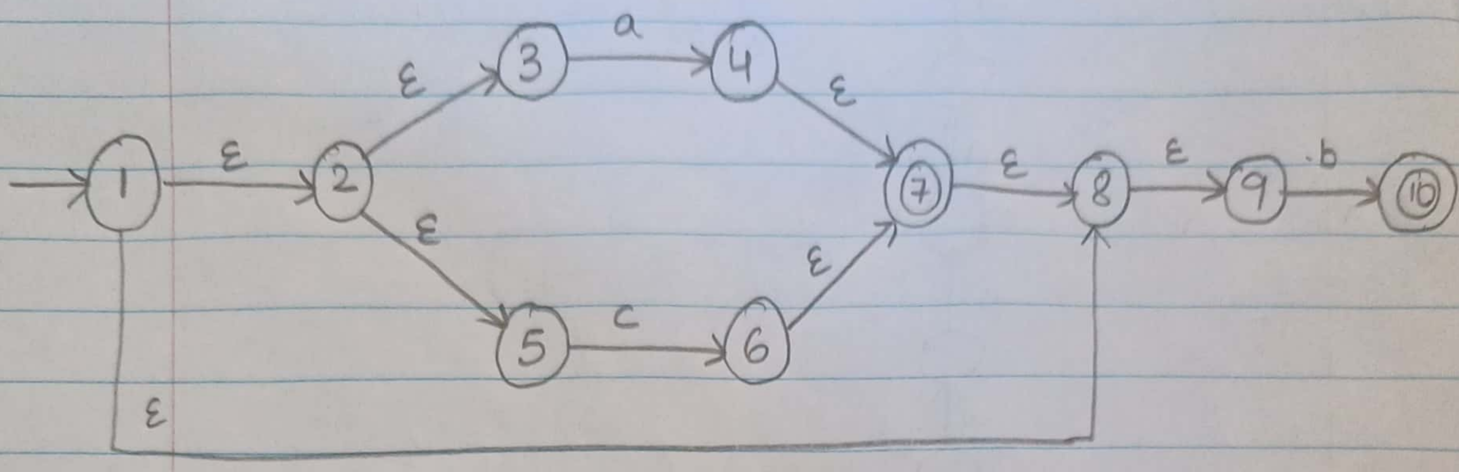
aa^*



Expression :- $aa(a|b|c)^* bb$


a
ε
a
ε
ε
ε
ε
ε
a
b
c
ε
ε
ε
ε
ε
ε
ε
b
ε
b
ε

10pts
5) Convert the following NFA into a DFA without ε-transitions using the Subset Construction (ε closure) draw the result DFA



i Start State

$S_0 = \{1, 2, 3, 5, 8, 9\}$

ii $S_0 = \{1, 2, 3, 5, 8, 9\}$

$(S_0)_a = \{4\} = \{4, 7, 8, 9\} = S_1$ final state

$(S_0)_b = \{10\} = \{10\} = S_2$ final state

$(S_0)_c = \{6\} = \{6, 7, 8, 9\} = S_3$ final state

iii from S_1 → $S_1 = \{4, 7, 8, 9\}$

$(S_1)_a = \{4\} = X$

$(S_1)_b = \{10\} = \{10\} = S_2$ final state

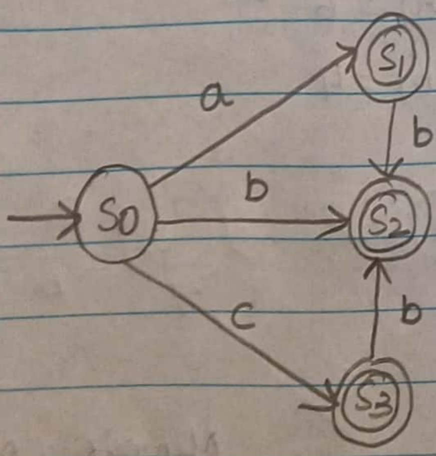
$(S_1)_c = \{6\} = X$

iv from S_2 : $S_2 = \{10\}$

$(S_2)a = \{4\} = x$
$(S_2)b = \{10\} = x$
$(S_3)c = \{6\} = x$

v from S_3 : $S_3 = \{6, 7, 8, 9\}$

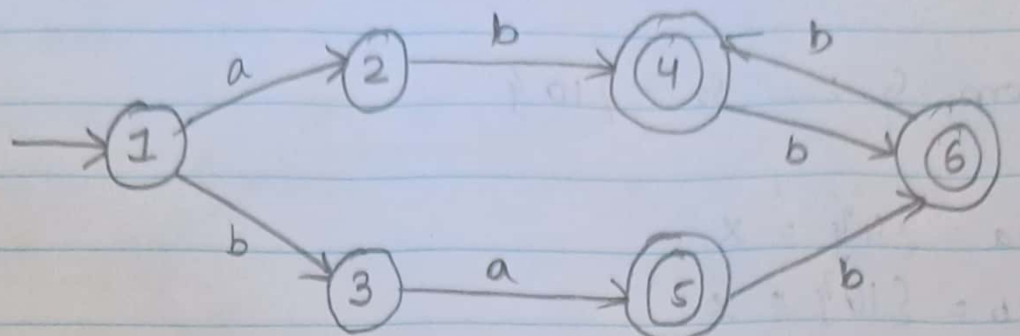
$(S_3)a = \{4\} = x$
$(S_3)b = \{10\} = \{10\} = S_2$ final state
$(S_3)c = \{6\} = x$



Initial state $= S0$
final state $= S_1, S2, S3$

6) Apply the State Minimization algorithm of section 2.4.4 to the following DFA. draw the resulting DFA

10pts



$S_0 = \{1, 2, 3\}$

$S_1 = \{4, 5, 6\}$

$S_0 = T(1,a) = 2 \quad T(1,b) = 3$

$S_1 = T(2,a) = x \quad T(2,b) = 4$

$S_2 = T(3,a) = 5 \quad T(3,b) = x$

$S_3 = T(4,a) = x \quad T(4,b) = 6$ } $S_3 = \{4,5\}$

$= T(5,a) = x \quad T(5,b) = 6$

$S_4 = T(6,a) = x \quad T(6,b) = 4$

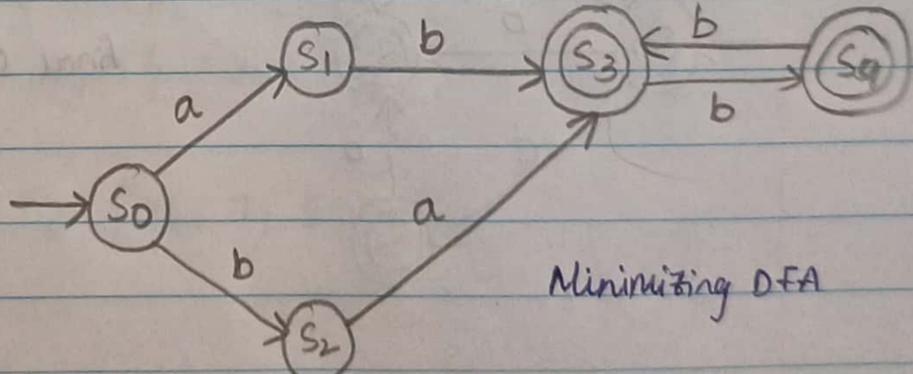
$S_0 = \{1\}$

$S_1 = \{2\}$

$S_2 = \{3\}$

$S_3 = \{4,5\}$

$S_4 = \{6\}$



Minimizing DFA