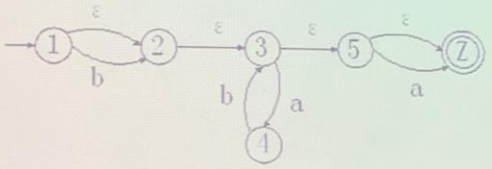
1. (10 Points) Write regular expressions for the following languages.
(a) (5 Points) Regular expressions for the language L={$a^m b^n c^k$| m≥1,n≥2,k≥1}
(b) (5 Points) The set of all decimal integers that are multiples of 5, there can be with optional sign (+ or -) , (if the digit number is greater than or equal to 2, the highest digit is not equal to zero).

2. (10 Points) Consider the following Nondeterministic Finite Automaton (NFA) over the alphabet Σ = {a, b}.



(a) (5 Points) Give a one-sentence description of the language recognized by the NFA.
(b) (5 Points) Write a regular expression for this NFA.

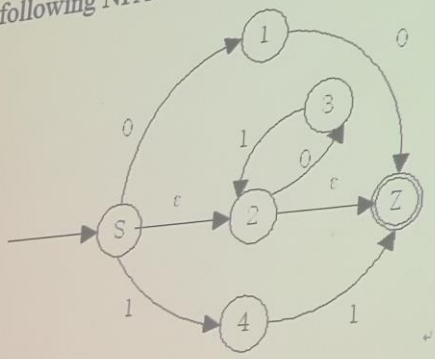
3. (10 Points) Let L be the language over Σ ={+, -, . ,E, d} such that every string in L is in the form of (+|-)dd*.d*E(+|-)dd. Draw a non-deterministic finite automaton (NFA) for L.

4. (18 Points) Consider the following grammar G[A]:

A→A∨B | B　　B→B∧C | C　　C→ ¬ D | D　　D→ (A) | i

(a) (6 points) For each non-terminal, to eliminate left recursion.
(b) (8 points) Calculating the FIRST and FOLLOW sets of each non-terminal of the above grammar.
(c) (4 points) Draw the LL(1) Parsing Table of this grammar.

5. (12 points) Consider the following NFA:



(a) (4 points) What language does the NFA accept? Please describe it in natural language.
(b) (8 points) Convert the NFA to an equivalent DFA.

(b) (8 points) Conv...

6. (16 points) Consider the following grammar G[E']:

0 E'→E 1 E→E+T 2 E→T 3 T→T*F
4 T→F 5 F→(E) 6 F→i

(a) (8 points) Construct a DFA for viable prefixes of this grammar using LR(0) items.

(b) (4 points) Calculating the FIRST and FOLLOW sets of each non-terminal of the above grammar.

(c) (4 points) Draw the SLR (1) Parsing Table of this grammar.

7. (12 points) Consider the following fragment of three-address instructions:

```
(1)        b := 1
(2)        b := 2
(3)        if w <= x goto B
(4)        e := b
(5)        jump B
(6)   A:   jump D
(7)   B:   c := 3
(8)        b := 4
(9)        c := 6
(10)       D:   if y <= z goto E
(11)
(12)       E:   g := g + 1
(13)            h: = 8
(14)            jump A
(15)            c:=4
(16)            b:= 5
(17)       End: h := 9
```

Please partition these three-address instructions into basic blocks:

(a) (4 points) Find the leaders of these basic blocks;

(b) (8 points) Draw the control flow graph of these basic blocks.

8. (12 points) Consider the following basic blocks:

A:=B*C D:=B/C E:=A+D F:=E*2 G:=B*C

H:=G*G F:=H*G L:=E M:=H

(a) (8 points) Construct a DAG for this basic block.

8. (12 points) Consider the following basic blocks:

A:=B*C D:=B/C E:=A+D F:=E*2 G:=B*C

H:=G*G F:=H*G L:=E M:=H

(a) (8 points) Construct a DAG for this basic block.

(b) (4 points) Assuming that only F and M are live on exit from this basic block, simplify the three-address code.