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NED UNIVERSITY OF ENGINEERING & TECHNOLOGY, KARACHI
FINAL YEAR (COMPUTER SCIENCE AND INFORMATION TECHNOLOGY)
ANNUAL EXAMINATION 2007
BATCH 2003-04

Time: 3 Hours

Dated: 24-10-2007

Max. Marks: 80

COMPILER DESIGN - (CT-454)

Instructions : Attempt any **FIVE** questions, including Q.1 which is compulsory.

Q.1 Write appropriate choice on the answer sheet.

(20)

- (a) Which is NOT a part of a language processing system discussed?
*Linker *Preprocessor *Assembler *Interpreter
- (b) _____ phase is responsible for converting time consuming operations by cheaper ones.
*Code Optimizer *Semantic Analyzer *Error Handler *Intermediate Code Generator
- (c) In _____ parsing technique a procedure is associated with each Non Terminal of the grammar.
*Recursive descent * Non recursive predictive * Shift reduce *LR
- (d) _____ is a partially parsed expression and incomplete derivation.
*handle * viable prefix * handle pruning * none of them.
- (e) _____ start at the root and recursively visit the children at each node from Left to right order.
* Breath first traverse * Depth First traverse *Heuristic
- (f) What is NOT true about dependency graph?
*it works with L-attributed definitions
*it has nodes corresponding to attributes
*it doesnot follow depth-first traversal
*it can be used to find out the evaluation order of semantic rules
- (g) _____ grammar is the one that produces more than one parse tree for same sentence
*unambiguous *ambiguous *Context free * simple grammar
- (h) The main reason for defining "Buffer pair with sentinel" is:
*to reduce two checks for advancing the forward pointer to one
*to eliminate the erroneous processing that occurs at the end of the second buffer
*to concatenate the last lexeme which is under process at the end of the second buffer with the starting lexeme of the first buffer
*to find out the end of the source program in an efficient manner
- (i) A process of reducing some string "W" to the start symbol of the grammar is called
* predictive parsing * shift reduce * bottom up parsing * top down parsing
- (j) The process of reduces the handle by the production left side is called _____
* handle pruning * handle * viable prefix *none of them
- (k) In SLR reduction process is done by the equation.
* $2x|B|$ * $2xB$ * $|B|$ * B
- (l) If G is a grammar with start symbol S then G' is _____.

*Closure of G * Goto Operation of G * Augmented grammar of G *none of them.

(m) What is/are true about tokens?

I)it facilitates the syntax analysis process

II)it is a generalized form of a group of lexemes

III)it is formed when a lexeme is matched with a pattern

IV)it is generated for each character of the source program

*I,III & IV * III only *II & III *I, II & III *I,II,III & IV

(n) Which condition will restrict multiple entries for nonterminal A in LL(1) parsing table.

*if $FIRST(A) = \{a\}$ then FOLLOW sets should not contain 'a'.

*if $FIRST(A) = \{a, \epsilon\}$ then FOLLOW(A) should not contain 'a'

*if FIRST(A) contains ϵ then FOLLOW(A) should not contain '\$'

*if $FIRST(A) = \{a, \epsilon\}$ then FOLLOW sets of nonterminals other than A should not contain 'a'

(o) Reading character by character from file is time consuming because of this _____
came into existence

* input buffering *output buffering * beginning pointer *forward pointer

(p) Consider the grammar:

$S \rightarrow aAB \mid cA \mid \epsilon$

$A \rightarrow bcA \mid S \mid \epsilon$

$B \rightarrow bB \mid a$

Which sentence is NOT related with the given grammar ?

*acbcba *abbbba *acbbcb *cbcaca

(q) An S-attributed definition is one :

*which is not L-attributed

*which uses synthesized attributes exclusively

*which uses semantic rules for both synthesized and inherited attributes

*which uses simultaneous attributes in coherent manner

(r) Which of the following is true about Syntax directed definition?

*High level specification of translation

*Hide implementation detail

* Free user from explicit specification of order in which translation takes place

*all of them

*none of them

(s) Code optimizer phase of the compiler belong to _____

* synthesis modal * Analysis model * Error handler * Symbol table

(t) The efficiency of the compiler is dependant on _____.

* syntax analyzer * semantic analyzer * code optimizer * lexical analyzer

Q.2 Consider the following grammar:

(15)

(1) $S \rightarrow P B$

(2) $P \rightarrow id$

(3) $B \rightarrow (E)$

(4) $E \rightarrow B$

(5) $E \rightarrow \epsilon$

(6) $E \rightarrow E F$

(7) $E \rightarrow P$

(8) $F \rightarrow \sim P$

(a) Construct SLR parsing table for the grammar.

(b) If the above grammar is SLR then show the moves made by the parser for the sentence:

id ((~ id)) \$

Q.3 Write a context free grammar for a sample language that has the following specifications. (15)

- An SL program starts with a reserve word PROG and followed by program name and a Block.
- A block start with START and ends with FINISH.
- The Block consists of declarations and statements.
- Statements can be assignment, display, for, Switch, input and block.
- Declaration start with a list of variables followed by colon **:** and then a type.
- The naming rule for defining a program name is similar to that for defining a variable.
- A variable starts with a letter or \$ followed by letters or digit.
- Type could be integer char or float

Syntax can be observed in the following sample program:

```

PROG first
  START
  a,b: INT;
  c: CHAR;
  FOR (a=0;a<5;a=a+1)
    START
      DISPLAY("result=",a);
      INPUT c;
      SWITCH (c)
      CASE 'A'
        DISPLAY ("Case A");
      DEFAULT
        DISPLAY ("ERROR");
      ENDSWITCH
    FINISH
  FINISH

```

Q.4 Consider the following grammar and its SLR parsing table: (15)

- 1) $E \rightarrow E \text{ or } T$
- 2) $E \rightarrow T$
- 3) $T \rightarrow T \text{ and } F$
- 4) $T \rightarrow F$
- 5) $F \rightarrow \text{not } F$
- 6) $F \rightarrow (E)$
- 7) $F \rightarrow b$

State	action							goto		
	b	or	and	not	()	\$	E	T	F
0	S6			S4	S5			1	2	3
1		S7					Acc			
2		R2	S8			R2	R2			
3		R4	R4			R4	R4			
4										9
5	S6			S4	S5			10	2	3
6		R7	R7			R7	R7			
7	S6			S4	S5				11	3
8	S6			S4	S5					12
9		R5	R5			R5	R5			
10		S7				S13				
11		R1	S8			R1	R1			
12		R3	R3			R3	R3			
13		R6	R6			R6	R6			

- (a) Write Syntax-directed definition of the Boolean expressions.
 (b) Show the moves made by the SDD on the input:

not (1 and 0) or 1 \$

Note : 0 and 1 are values of b

Q.5: Consider the grammar:

$D \rightarrow D ; F \mid a : T \mid D ; H$

$T \rightarrow \mathbf{b} \mid \mathbf{b} [\mathbf{n}]$

$H \rightarrow H [H] \mid F$

$F \rightarrow \mathbf{n} \mid \mathbf{a}$

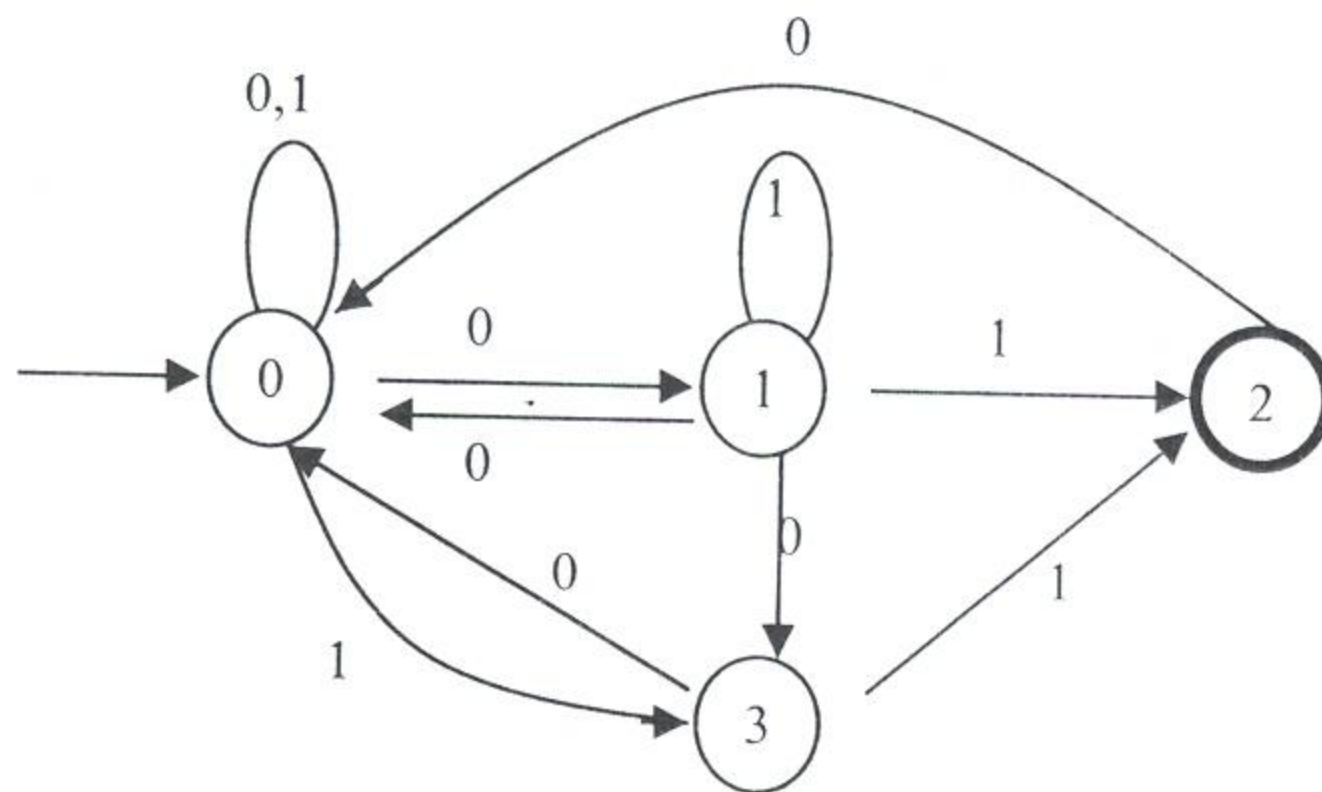
(15)

- (a) Make the grammar predictive.
 (b) Compute First and Follow sets for the above grammar
 (c) Construct predictive parsing table
 (d) If the above grammar is LL(1) then show the moves made by parser on the input :

a : b [n] ; a [a [n]] \$

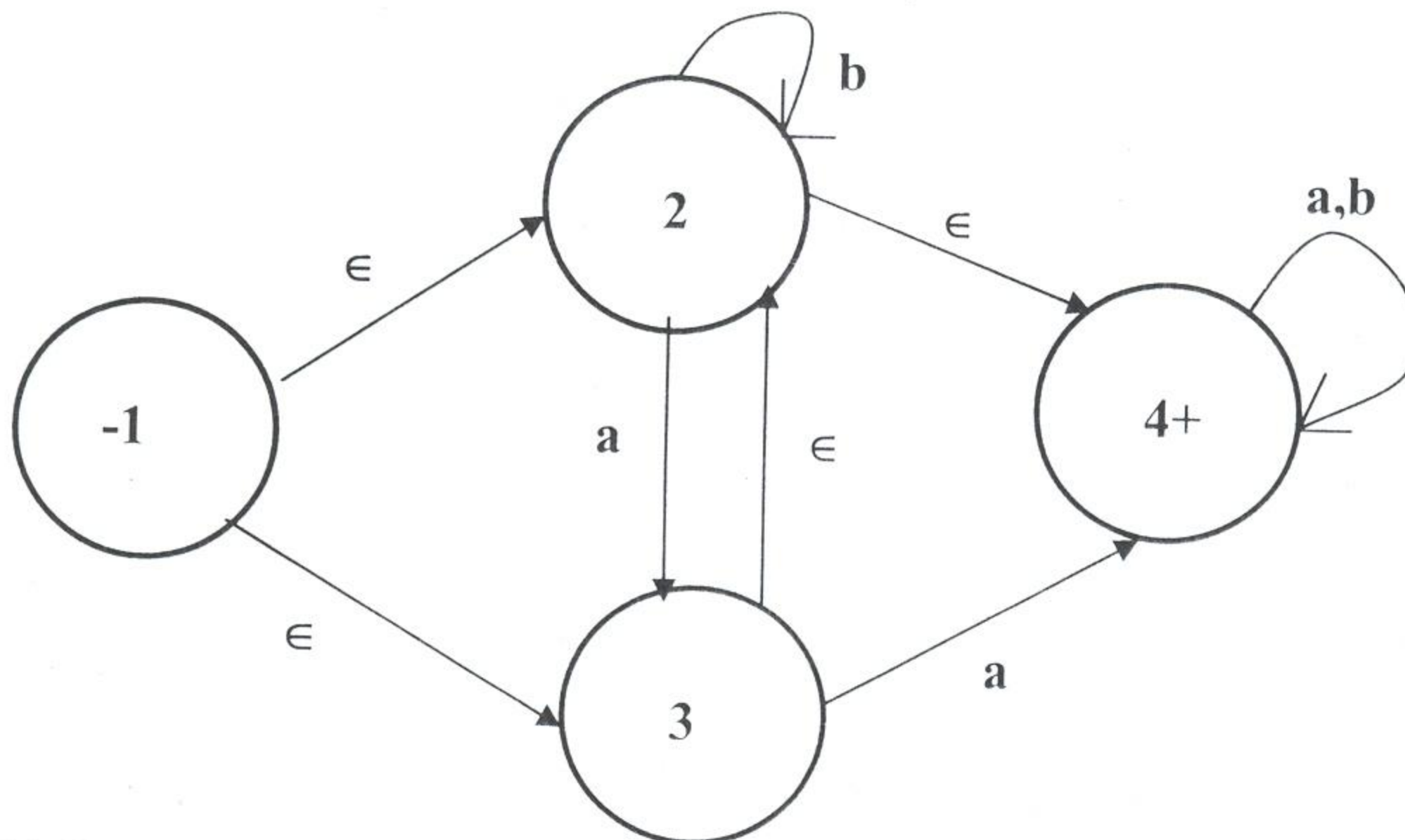
Q.6 Convert the following NFA into its equivalent DFA.

(15)



Q7: (a) Construct the NFA for the NFA- ϵ given as.

(15)



(b) Show that the following strings are accepted by the obtained NFA using Transition Mapping Function (δ).

- (i) abbaba (ii) babbaa

Q8: (a) Find the Regular Expression corresponding to each of the following input alphabets $\Sigma = \{a,b\}$.

(15)

- (i) The Language of all strings containing exactly two b's.
- (ii) The Language of all strings containing at least one b.
- (iii) The Language of all strings that do not end with aa.
- (iv) The Language of all strings in which both the number of a's and the number of b's are odd.
- (v) The Language of all strings that have at least one **a** and at least one **b**.
- (vi) The Language of all words that do not contain a double letter.

(b) For each of the following regular expressions, draw an FA recognizing the corresponding language.

- (i) $(0+1)^*0$
- (ii) $(11+10)^*$
- (iii) $(1+110)^*0$
- (iv) $1(01+10)^* + (11+10)^*$
- (v) $1(1+10)^* + 10(0+01)^*$
- (vi) $1^*01^*(01^*01^*)^*$

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