

Solutions and Evaluation Criteria of 'Part 2' (Closed Book)

Solution of Q1.

a) [2 Marks]

The given grammar is not LL (1) since, it is not left-factored and also has left recursion. Left factoring is required in $S \rightarrow 0 \mid 1S2S3 \mid 1A3$ whereas, left recursion needs to be removed from $A \rightarrow S \mid AS$

[Evaluation Criteria: 1 Mark is given for mentioning the reasoning related to left factoring and 1 Mark for mentioning the left recursion]

b) [5 Marks]

Given Grammar is as follows:

$S \rightarrow 0 \mid 1S2S3 \mid 1A3$

$A \rightarrow S \mid AS$

Step1: On the removal of left recursion and handling the left factoring, the modified grammar looks like as follows:

$S \rightarrow 0 \mid 1S'$

$S' \rightarrow S2S3 \mid A3$

$A \rightarrow SA'$

$A' \rightarrow SA' \mid \epsilon$

The modified grammar is still not LL(1). Hence, go for step 2.

Step 2: Perform the substitution of $A \rightarrow SA'$ on $S' \rightarrow A3$. The re-modified grammar is as follows:

$S \rightarrow 0 \mid 1S'$

$S' \rightarrow S2S3 \mid SA'3$

$A' \rightarrow SA' \mid \epsilon$

Step 3: Finally, the resultant LL(1) grammar (after handling the left factoring) is as follows:

$S \rightarrow 0 \mid 1S'$

$S' \rightarrow SS''$

$S'' \rightarrow 2S3 \mid A'3$

$A' \rightarrow SA' \mid \epsilon$

[Evaluation Criteria: Full Marks are given for showing the precise LL(1) Grammar. Else, half marks (2.5 Marks) are deducted for still showing the non-LL(1) grammar]

c) [4 Marks]

Grammar Symbols	First Set	Follow Set
S	{0, 1}	{0, 1, 2 3, \$}
S'	{0, 1}	{0, 1, 2 3, \$}
S''	{0, 1, 2, 3}	{0, 1, 2 3, \$}
A'	{0, 1, ε}	{3}

[Evaluation Criteria: 0.5 Mark is given for each correct entry of first and follow set of all four Grammar symbols. In addition, penalty of 1 Mark is also imposed for those students, who have computed the first and follow set of non-LL(1) Grammar (computed in Part (b))]

d) [4 Marks]

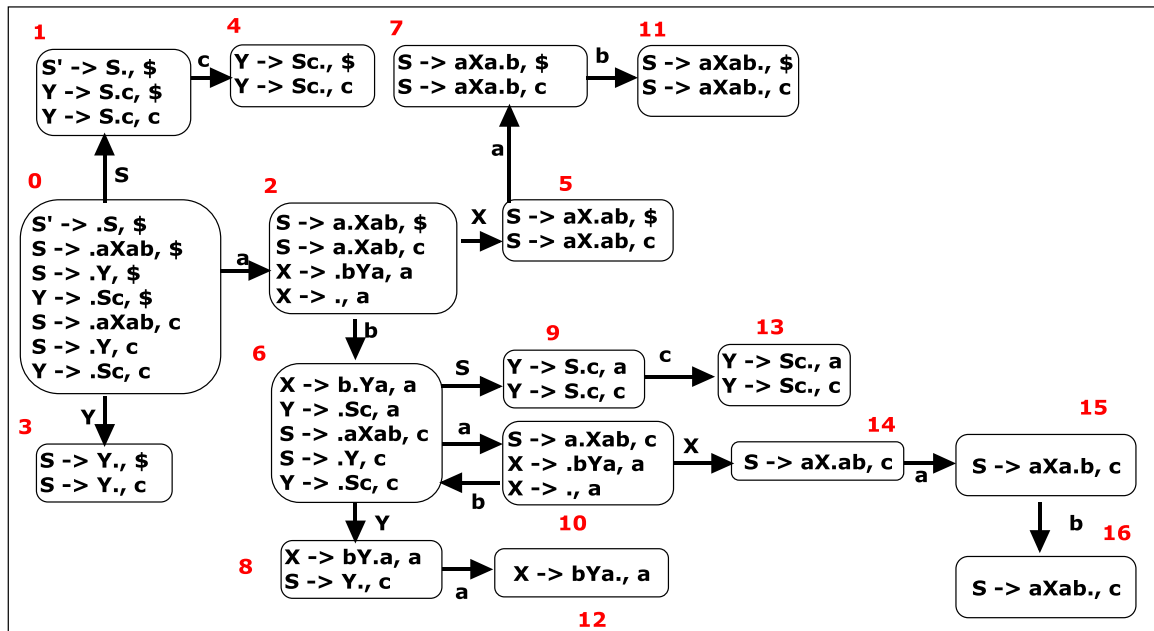
Predictive Parsing Table

	0	1	2	3	\$
S	S → 0	S → 1S'	Error	Error	Error
S'	S' → SS''	S' → SS''	Error	Error	Error
S''	S'' → A'3	S'' → A'3	S'' → 2S3	S'' → A'3	Error
A'	A' → SA'	A' → SA'	Error	A' → ε	Error

[Evaluation Criteria: 1 Mark is given for each complete correct row in the predictive parsing table. Similarly, penalty of 1 Mark is also imposed for those students, who have designed the predictive parsing table of non-LL(1) Grammar (computed in Part (b))]

Solution of Q2.

a) [5 Marks]



[Evaluation Criteria: Marks are deducted for showing the incorrect/incomplete states, imprecise LR(1) items, wrong GOTO entries, etc.].

b) [5 Marks]

	ACTION				GOTO		
States	a	b	c	\$	X	Y	S
0	S2	-	-	-	-	3	1
1	-	-	S4	Accept	-	-	-
2	R4	S6	-	-	5	-	-
3	-	-	R2	R2	-	-	-
4	-	-	R5	R5	-	-	-
5	S7	-	-	-	-	-	-
6	S10	-	-	-	-	8	9
7	-	S11	-	-	-	-	-
8	S12	-	R2	-	-	-	-
9	-	-	S13	-	-	-	-
10	R4	S6	-	-	14	-	-
11	-	-	R1	R1	-	-	-
12	R3	-	-	-	-	-	-
13	R5	-	R5	-	-	-	-
14	S15	-	-	-	-	-	-
15	-	S16	-	-	-	-	-
16	-	-	R1	-	-	-	-

*[Evaluation Criteria: Marks are deducted for showing incorrect entries in the action and GOTO part of parsing table. In addition, penalty of **1 Mark** is imposed on those students who have designed the wrong GOTO graph in part a]*