Course Code:	Course Name: Compiler Construction	
Instructor Name / Names: M. Shahzad		
Student Roll No:		Section No:

Instructions:

- Return the question paper.
- Read each question completely before answering it. There are **3 questions and 2 pages**.
- In case of any ambiguity, you may make assumption. But your assumption should not contradict any statement in the question paper.
- All the answers must be solved according to the sequence given in the question paper.
- This paper is subjective. All the questions should be attempted on the answer sheet.
- All questions carry equal marks and equally distributed in sub parts.

Time: 60 minutes.   **Max Marks**: 30 points

SOLUTION PAPER

Question 1 (10 points = 2 * 5):

1) Describe the relationship between a production and an item in an LR(0) grammar.   [2 points]

2) What are the error handling mechanisms in parsing phase?   [2 points]

3) Demonstrate stack implementation in implementation of shift reduce Parsing.   [2 points]

4) What are the requirements of the grammar to be in LL(1) grammar?   [2 points]

5) Explain the limitation of the recursive descent parsing.   [2 points]

Question 2 (10 points = 2 * 5):

 Consider the following grammar H (the different productions have been numbered):

1. S → [SX]
2. S → a
3. X → ε
4. X → +SY
5. X → Yb
6. Y → ε
7. Y → -SXc

It contains 3 non-terminals S, X and Y, along with terminals [,], a, b, c, +, - and ε.

a) Fill in the table below with the First and Follow sets for the non-terminals in this grammar   [5 points]

	First	Follow
S	**a, [**	**$,+,-,],c,b**
X	**+,-,b, ε**	**],c**
Y	**-,ε**	**],c,b**

b) Fill in the parse table below for the grammar H (don't write the productions inside the table; write only their numbers as given above)   [5 points]

|	a	b	c	+	-	[	]	$
S	2					1		
X		5	3	4	5		3	
Y		6	6		7		6	

Question 3 (10 points = 2* 5):

a) Draw the LR(1) parsing DFA for the following grammar.   [5 points]

$$S \rightarrow aSb$$
$$S \rightarrow c$$

Answer: First we need to augment the grammar with an additional production $S' \rightarrow S$.
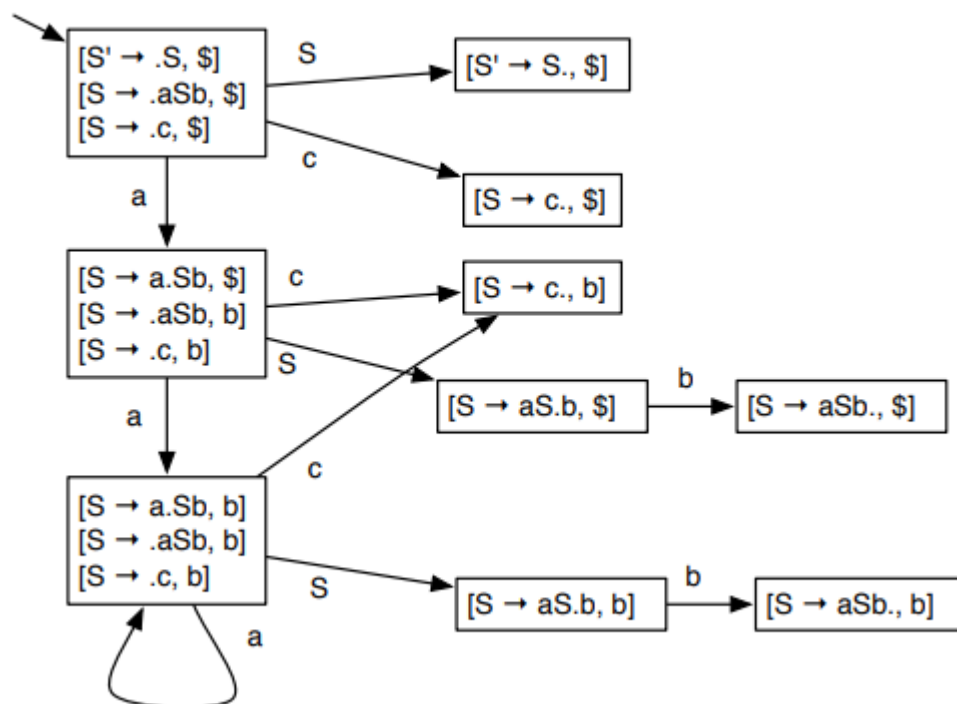
b) Write down the grammar and the action and goto tables corresponding to the following LR(1) parsing DFA. [5 points]

```
    ┌──────────────┐        ┌──────────────┐
 →  │ state 0      │   S    │ state 3      │
    │ [S' → .S, $] │ ─────► │ [S' → S., $] │
    │ [S → .aA, $] │        │              │
    └──────────────┘        └──────────────┘
         │ a
         ▼                  ┌──────────────┐
    ┌──────────────┐   A    │ state 4      │
    │ state 1      │ ─────► │ [S → aA., $] │
    │ [S → a.A, $] │        └──────────────┘
    │ [A → .Bb, $] │
    │ [B → .c, b]  │   B    ┌──────────────┐
    │              │ ─────► │ state 5      │
    └──────────────┘        │ [A → B.b, $] │
         │ c                └──────────────┘
         ▼                       │ b
    ┌──────────────┐             ▼
    │ state 2      │        ┌───────────────┐
    │ [B → c., b]  │        │ state 6       │
    └──────────────┘        │ [A → Bb., $]  │
                            └───────────────┘
```

Answer:

$$
\begin{aligned}
S' &\rightarrow S \\
0. \quad S &\rightarrow aA \\
1. \quad A &\rightarrow Bb \\
2. \quad B &\rightarrow c
\end{aligned}
$$
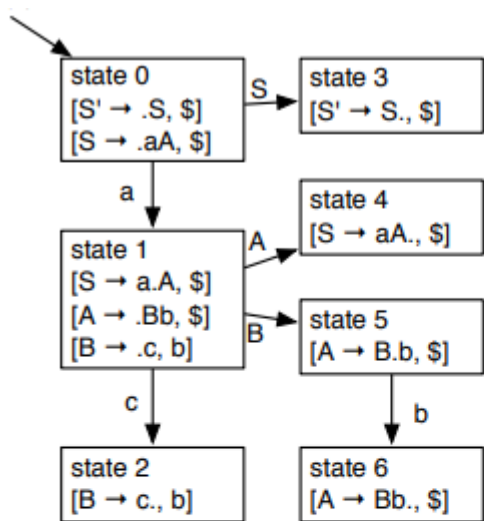
state	action				goto		
	a	b	c	$	A	B	S
0	s1						3
1			s2		4	5	
2		r2					
3				accept			
4				r0			
5		s6					
6				r1			

BEST OF LUCK!