26-28

#### Begum Rokeya University, Rangpur.

#### Department of Computer Science and Engineering

(B.Sc. Engg.) 4<sup>th</sup> Year 1<sup>st</sup> Semester Final Examination, 2017.(Session:2013-14)

Course Title: Compiler Design; Course Code: CSE 4101

Full Marks: 50

Time: 3.00 Hours

Answer Any Five from the Given Questions

(Note: Numbers in the right margin indicate marks for each question. Answer questions sequentially)

< 1. What do you mean by front end in compiler design? Show the output produced by it in (a) different stages for a:=b\*c/36; where a, b and c are real numbers. Explain the way in which high level languages are processed by interpreter and compiler. (b) 2 Explain the role of assembler, compiler, loader and linker in the language processing system. (c) 4 Define lexeme, token and pattern. Identify the lexemes that make up the tokens in the following 4 program segment E = M\*C\*\*2. Indicate corresponding token and pattern. What is the relationship with lexical analyzer, regular expressions and transition diagram? Give (p) 3 Write a regular expression for unsigned numbers and design the transition diagram for it. (e) 3 You are given a table (Table-1) containing some tokens, their tokens and corresponding 3. (a) 5 attribute value. Now write a lex program to identify these lexemes.

Table-1

2,22 [+1-16)2

LEXEMES	TOKEN NAME	ATTRIBUTE VALUE	
Any ws	MALE.		
if	if		
then	then		
else	else		
Any id	id	Pointer to table entry	
Any number	number	Pointer to table entry	
<	relop	LT	
<=	relop	LE	
=	relop	EQ	
<>	relop	NE	
>	relop	GT	
>=	relop	GE	

- (b) Construct an NFA for the regular expression: (a|b)\*abb and convert this NFA to corresponding DFA by subset construction of that NFA.
- (a) What are the four components of a CFG? Define with example.

3 5

(b) Give a leftmost and rightmost derivations of the following grammar and hence test for the ambiguity of the grammar:

 $E \rightarrow E + T \mid T$   $E \rightarrow T$   $T \rightarrow T * F \mid F$   $T \rightarrow F$  $F \rightarrow (E) \mid a$   $F \rightarrow \infty$ 

How can we eliminate ambiguity of a grammar?

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5. (a) What is an LL(1) grammar? When the grammar is said to be LL(1) grammar?

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(b) Write the comparisons between SLR and LALR parser

2

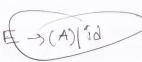
(c) Write the conflicts that may occur during shift reduce parsing. Consider the dangling-else grammar.

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(d) What do you mean by Handle pruning? Left factor the given grammar:  $L \rightarrow \text{int} \mid \text{int}, L \mid (L)$ 

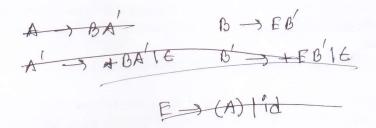
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- **6.** You are given the following grammar:
  - $A \to A * B | B$
  - $B \rightarrow B + E \mid E$
  - $E \rightarrow (K) | id$



Using LL(1) parser-

- (i) Check for the recursion and factor of grammar
- (ii) Identify the FIRST() and FOLLOW() of above grammar
- (iii) Produce corresponding parse table
- (iv) Push the operations in a Stack according to Inputs of parse table
  - (v) Generate the corresponding parse tree.
- 7. (a) What is the purpose of defining augmented grammar before constructing LR(0) items?
  - (b) What are different intermediate code forms? Convert the expression  $\mathbf{a} = \mathbf{b} * \mathbf{c} + \mathbf{b} * \mathbf{c}$  into three address statements.
  - (c) What is code optimization? Explain machine dependent and independent code optimization.



3

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 $L \rightarrow \text{int} \mid \text{int}, L \mid (L)$ 

Time: 3.00 Hours

#### Answer Any Five from the Given Questions

(Note: Numbers in the right margin indicate marks for each question. Answer questions sequentially)

- What do you mean by front end in compiler design? Show the output produced by it in 4 1. different stages for a:=b\*c/36; where a, b and c are real numbers. Explain the way in which high level languages are processed by interpreter and compiler. 2 Explain the role of assembler, compiler, loader and linker in the language processing system. (c) Define lexeme, token and pattern. Identify the lexemes that make up the tokens in the following 4 2. (a) program segment E = M\*C\*\*2. Indicate corresponding token and pattern. What is the relationship with lexical analyzer, regular expressions and transition diagram? Give 3 Write a regular expression for unsigned numbers and design the transition diagram for it. 3 (c) You are given a table (Table-1) containing some tokens, their tokens and corresponding 5 (a)
- attribute value. Now write a lex program to identify these lexemes.

Table-1

LEXEMES	TOKEN NAME	ATTRIBUTE VALUE
Any ws		
if	if	
then	then	
else	else	
Any id	id	Pointer to table entry
Any number	number	Pointer to table entry
<	relop	LT
<=	relop	LE
===	relop	EQ
<>	relop	NE
>	relop	GT
>=	relop	GE

<= = <> >	relop relop relop relop	LE EQ NE GT GE		
Construct an NFA for the regular of	expression: (a b	and the state of t	5	
What are the four components of a CFG? Define with example.				
			5	
11 1	of a grammar?		2	
) Write the comparisons between SLR and LALR parser				
grammar.			3	
	<ul> <li>Construct an NFA for the regular of DFA by subset construction of that What are the four components of a ambiguity of the grammar:</li> <li>E → E + T   T</li> <li>T → T * F   F</li> <li>F → (E)   a</li> <li>What is an LL(1) grammar? When Write the comparisons between States</li> <li>Write the conflicts that may occurrence.</li> </ul>	Construct an NFA for the regular expression: (a b)  DFA by subset construction of that NFA.  What are the four components of a CFG? Define of the derivations of the ambiguity of the grammar:  E \to E + T   T  T \to T * F   F  F \to (E)   a  How can we eliminate ambiguity of a grammar?  What is an LL(1) grammar? When the grammar is the write the comparisons between SLR and LALR properties.  Write the conflicts that may occur during shift grammar.	Construct an NFA for the regular expression: (a b)*abb and convert this NFA to corresponding DFA by subset construction of that NFA.    What are the four components of a CFG? Define with example.   Give a leftmost and rightmost derivations of the following grammar and hence test for the ambiguity of the grammar:   E \rightarrow E + T   T   T \rightarrow T * F   F   F \rightarrow (E)   a     How can we eliminate ambiguity of a grammar?    What is an LL(1) grammar? When the grammar is said to be LL(1) grammar?   Write the comparisons between SLR and LALR parser   Write the conflicts that may occur during shift reduce parsing. Consider the dangling-else grammar.	

You are given the following grammar:  $A \to A * B \mid B$  $B \rightarrow B + E \mid E$  $E \rightarrow (K) | id$ Using LL(1) parser-Check for the recursion and factor of grammar (i) Identify the FIRST() and FOLLOW() of above grammar (ii) Produce corresponding parse table (iii) Push the operations in a Stack according to Inputs of parse table (iv) Generate the corresponding parse tree. (v) What is the purpose of defining augmented grammar before constructing LR(0) items? 3 7. (a) What are different intermediate code forms? Convert the expression  $\mathbf{a} = \mathbf{b} * - \mathbf{c} + \mathbf{b} * - \mathbf{c}$  into 4 (b) three address statements.

What is code optimization? Explain machine dependent and independent code optimization.

(c)

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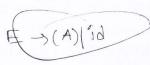
(Note: Numbers in the right margin indicate marks for each question. Answer questions sequentially)

	(1		laicate marks for	each question. Answer questions sequentially)			
· 1.	(a)	What do you mean by front end in compiler design? Show the output produced by it in 4 different stages for $a:=b*c/36$ ; where a, b and c are real numbers.					
	(b)	Explain the way in which high le	vel languages are	nrocessed by interpretary and	2		
	(c)	Explain the way in which high level languages are processed by interpreter and compiler.  Explain the role of assembler, compiler, loader and linker in the language processing system.					
(3	(0)				4		
2:	(2)	program segment L -M C 2. III	uicale correspond	emes that make up the tokens in the following	4		
	(p)	an example.	cal analyzer, reg	ular expressions and transition diagram? Give	3		
	(e)	Write a regular expression for una	signed numbers a	and design the transition diagram for it.	3		
3.	(a)	You are given a table (Table-1) co attribute value. Now write a <b>lex</b> p	ontaining some <b>t</b> rogram to identif	okens, their tokens and corresponding by these lexemes.	5		
		Table-1			1-1410		
		LEXEMES Any ws	TOKEN NAME	ATTRIBUTE VALUE	11 16)2		
		if then	if				
		else	then				
		Any id Any number	id	Pointer to table entry			
		<	number relop	Pointer to table entry LT			
		<= =	relop	LE			
		<>	relop relop	EQ			
		>	relop	NE GT			
		>=	relop	GE			
	(p)	DFA by subset construction of tha	expression: (a b) t NFA.	*abb and convert this NFA to corresponding	5		
4.	(a)	What are the four components of a CFG? Define with example.					
	(b)	Give a leftmost and rightmost derivations of the following grammar and hence test for the			3 5		
		of the granning.					
		$E \to E + T \mid T \qquad \qquad E \to T$					
		$T \to T * F \mid F$					
	(a)r	$F \to (E) a$ $F \to a$					
,	(c)	How can we eliminate ambiguity o			2		
5.	(a)	What is an LL(1) grammar? When the grammar is said to be LL(1) grammar?			2		
	(b)	Write the comparisons between SLR and LALR parser					
	(c)	Write the conflicts that may occur during shift reduce reasing the conflicts that may occur during shift reduce reasing the conflicts that may occur during shift reduce reasing the conflicts that may occur during shift reduce reasing the conflicts that may occur during shift reduce reasing the conflicts that may occur during shift reduced reasing the conflicts that may occur during shift reduced reasing the conflicts that may occur during shift reduced reasing the conflicts that may occur during shift reduced reasing the conflicts that may occur during shift reduced reasing the conflicts that may occur during shift reduced reasing the conflicts that may occur during shift reduced reasing the conflicts that may occur during shift reduced reasing the conflicts that may occur during the conflict reasing the conflict rea			3		
	(d)	What do you mean by Handle pruni			3		
		$L \rightarrow \text{int} \mid \text{int, L} \mid (L)$					

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