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PES UNIVERSITY, Bangalore

UE18/19CS351

(Established under Karnataka Act No. 16 of 2013)

END SEMESTER ASSESSMENT (ESA) - B.TECH VI SEMESTER - May, 2022

UE18/19CS351 - COMPILER DESIGN

Time: 3 Hrs Answer All Questions Max Marks: 100

a	With a neat diagram, explain the interaction between first two phases of the compiler using the following input:												
	x = a + b * c;												
	· ·	ut(s) and	dout	put o	f eac	h pha	ise a	nd t	heir role)			
b	Given the lex script, answer the following:												
	%%												
	a?aab printf("2");												
	a?b printf("1");												
	aab printf("3");												
					-		_						
										he output.			
С		desi	gn o	f a le	exica	l ana	lyzer.	,			5		
a	_										10		
											(2+3+5)		
	Answer the following:												
					1	41 4	1			- ! I I (1)40			
1-								amr	nar 1	s in LL(1) or not?	5		
D	Given the LALK parsing table, p	arse	e tne	strin	ıg:	*1a=	la			100	3		
		ſ	id	*	=0.00	\$	S	L	R				
	Γ	0	s5	s4			1	2	3				
	Grammar	1				acc			20				
		2			s6	r6							
					20								
			~ £	~4		13		0	7				
			SJ	S4	-			9	J				
	ACCORDED DESCRIPTION DESCRIPTION	100			ro	ro							
		0000	s5	s4	20.	22		9	8				
	$0. K \rightarrow L$	1-0.0-6			r4	r4							
		8				r2							
	L	9			r6	r6				1			
	b	using the following input: x = a + b * c; (Note : clearly mention ALL inp) b Given the lex script, answer the * %% a?aab printf("2"); a?b printf("1"); aab printf("3"); I. What will be output of a II. Specify an input string for III. Which of the aforemention c With a neat diagram explain the a Given the grammar: A → B C a B → b C λ C → ab Answer the following : I. What is first(A)? II. What is follow(A) and for III. Construct the LL(1) table	using the following input: $x = a + b * c;$ (Note: clearly mention ALL input(s) b Given the lex script, answer the follows a and printf("2"); $a?b printf("1");$ $aab printf("3");$ $I. What will be output of a lexe of the input string for word of the aforementioned of the aforem$	using the following input: $x = a + b * c$; (Note: clearly mention ALL input(s) and Given the lex script, answer the followin %% a?aab printf("2"); a?b printf("1"); aab printf("3"); I. What will be output of a lexer for II. Specify an input string for which III. Which of the aforementioned rule c With a neat diagram explain the design c a Given the grammar: c A \rightarrow B C a B \rightarrow b C c A c B c Answer the following: I. What is first(A)? II. What is follow(A) and follow(C) III. Construct the LL(1) table and specific b Given the LALR parsing table, parse the c	using the following input: $x = a + b * c$; (Note: clearly mention ALL input(s) and out) $\%$ a?aab printf("2"); a?b printf("3"); ab printf("3"); I. What will be output of a lexer for the II. Specify an input string for which the III. Which of the aforementioned rules are compared by the compar	using the following input: $x = a + b * c$; (Note: clearly mention ALL input(s) and output of Given the lex script, answer the following: $\%\%$ a?aab printf("2"); a?b printf("1"); aab printf("3"); I. What will be output of a lexer for the input II. Specify an input string for which the lexer III. Which of the aforementioned rules are use c With a neat diagram explain the design of a lexicate c A c B c I at B c B	using the following input: $x = a + b * c;$ $(Note : clearly mention ALL input(s) and output of each of the second output of each output of each$	using the following input: $x = a + b * c$; (Note: clearly mention ALL input(s) and output of each phase of the lex script, answer the following: %% a and printf("2"); a printf("1"); a printf("3"); a printf("3"); I. What will be output of a lexer for the input string: a II. Specify an input string for which the lexer will print III. Which of the aforementioned rules are useless and w with a neat diagram explain the design of a lexical analyzer. a Given the grammar: $A \rightarrow B C \mid a$ $B \rightarrow b C \mid \lambda$ $C \rightarrow ab$ Answer the following: I. What is first(A)? II. What is follow(A) and follow(C)? III. Construct the LL(1) table and specify whether the grammar: 1. $S \rightarrow S$ 2 $S \rightarrow S $	using the following input: $x = a + b * c$; (Note: clearly mention ALL input(s) and output of each phase at Given the lex script, answer the following: %% a?aab printf("2"); a?b printf("1"); aab printf("3"); I. What will be output of a lexer for the input string: aab III. Specify an input string for which the lexer will print 321 IIII. Which of the aforementioned rules are useless and why? c With a neat diagram explain the design of a lexical analyzer. a Given the grammar: $A \rightarrow B C \mid a$ $B \rightarrow b C \mid \lambda$ $C \rightarrow ab$ Answer the following: I. What is first(A)? II. What is first(A)? III. Construct the LL(1) table and specify whether the gramm b Given the LALR parsing table, parse the string: *id=id* Grammar: 1. $S' \rightarrow S$ 2. $S \rightarrow L = R$ 3. $S \rightarrow R$ 4. $S \rightarrow R$ 4. $S \rightarrow R$ 4. $S \rightarrow R$ 5. $S \rightarrow R$ 4. $S \rightarrow R$ 5. $S \rightarrow R$ 6. $S \rightarrow R$ 7. $S \rightarrow R$ 7. $S \rightarrow R$ 7. $S \rightarrow R$ 8. $S \rightarrow R$ 9. $S \rightarrow$	using the following input: $x = a + b * c$; (Note: clearly mention ALL input(s) and output of each phase and to Given the lex script, answer the following: %% a?aab printf("2"); a?b printf("1"); aab printf("3"); I. What will be output of a lexer for the input string: aab III. Specify an input string for which the lexer will print 321 as to III. Which of the aforementioned rules are useless and why? c With a neat diagram explain the design of a lexical analyzer. a Given the grammar: $A \rightarrow B C \mid a$ $B \rightarrow b C \mid \lambda$ $C \rightarrow ab$ Answer the following: I. What is first(A)? II. What is first(A)? III. Construct the LL(1) table and specify whether the grammar is divented by the following in the construction of the string: *id=id* Grammar: 1	using the following input: $x = a + b * c$; (Note: clearly mention ALL input(s) and output of each phase and their role) b Given the lex script, answer the following: $\%\%$ a?aab printf("2"); a?b printf("1"); aab printf("3"); I. What will be output of a lexer for the input string: aab II. Specify an input string for which the lexer will print 321 as the output. III. Which of the aforementioned rules are useless and why? c With a neat diagram explain the design of a lexical analyzer. a Given the grammar: $A \rightarrow B C \mid a$ $B \rightarrow b C \mid \lambda$ $C \rightarrow ab$ Answer the following: I. What is first(A)? II. What is follow(A) and follow(C)? III. Construct the LL(1) table and specify whether the grammar is in LL(1) or not? b Given the LALR parsing table, parse the string: *id=id Grammar: 1. $S \rightarrow S$ 2. $S \rightarrow L = R$ 3		

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	С	When does s/r and r/r conflict occur in SLR parser? Explain with an example or a dummy state diagram to depict the scenarios.									
3	a	Write short notes on:	Scenarios.	10							
		I. Types of attributes									
		II. Types of Syntax Directed Definitions									
		III. Procedure to convert SDD to SDT scheme									
	b	Write an SDD for simple type declaration consisting of basic type T and list of									
		identifiers L.									
		$D \to T L$ $T \to \inf \mid float$									
		$T \rightarrow \text{int} \mid \text{float}$ $L \rightarrow L, \text{id} \mid \text{id}$									
		$L \rightarrow L$, $IU \mid IU$									
	c	-	ut string 5 * 2 * 3 and provide an annotated parse tree as	5							
		output.									
		PRODUCTION S	EMANTIC RULES								
		1 ROBECTION 5	EMANTIC ITOLES								
		1) $T \rightarrow F T'$ $T'.i$	inh = F.val								
		T.v	al = T'.syn								
		9) TI > + FTI TI i	$inb = T'$ $inb \times F$ val								
			$inh = T'.inh \times F.val$								
		1.8	$syn = T_1'.syn$								
		3) $T' \to \epsilon$ $T'.8$	syn = T'.inh								
		4) $F \rightarrow \mathbf{digit}$ $F.v.$	$al = \mathbf{digit}.lexval$								
4	a	Answer the following:	1.7	10							
		I. What is a basic block? [1 m	- I	(5+5)							
		A. What is a leader? [1 mark] B. How are leaders identified? [3 marks]									
		D. How are leaders identified? [3 marks]									
		II. What is Code Optimization? [1 mark]									
		Briefly explain the following optimizations with an example:									
		A. Constant folding and propagation [2 marks]									
		B. Loop optimization ((Any one) [2 marks]								
	b	Convert the given program to SSA	form:	5							
		x = a[i];	TOTHI.	5							
		if $x > n$									
		x = x - n;									
		else									
		X = X + n;									
		y = x * 5;									

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	c	Given the flow graph, perform live variable analysis.	5
		$a = 1; b = 2$ $c = 3; n = 6$ $B2$ $if a \le 11$ $B4$ $t1 = a + b$ $a = t1 + c$ $print "Hello"$ $B5$	
5	a	Consider the C code to compute Fibonacci numbers recursively. The questions below assume that the initial call is f(5). int f(int n) { int t, s; if (n < 2) return 1; s = f(n-1); t = f(n-2); return s+t; } I. Show the complete activation tree. II. How does the stack and its activation records look like the first time f(1) is about to return?	10 (5+5)
	b	Using Simple Code Generator algorithm, generate target code sequence for the given basic block: 1. x = y+z 2. z = x*x 3. y = z 4. x = y+z Assume number of registers available are 2 i.e. R1 and R2. All the variables (x,y,z) are live on exit from the block.	5
	c	Provide the Activation Record structure.	5