

## **MUTHAYAMMAL ENGINEERING COLLEGE**

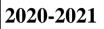
(An Autonomous Institution)

(Approved by AICTE, New Delhi, Accredited by NAAC & Affiliated to Anna University) Rasipuram - 637 408, Namakkal Dist., Tamil Nadu

## **MUST KNOW CONCEPTS**



MKC



Subject		16ITD08/Principles of Compiler Design			
S. No. Term		Notation (Symbol)	Concept/Definition/Meaning/Units/Equation/ Expression	Units	
	UNIT-I INTRODUCTION TO AUTOMATA AND COMPILER				
1	Translator		It converts source language into target language		
2	Compiler		System software which translates source program into target program		
3	Interpreter		System software which accepts source program line by line and produces target program		
4	Assembler		converts assembly language into machine code		
5	Loader		A loader is a program that places machine code of the programs into memory for execution		
6	Link-editor		The linker links the code in one file which may refer to a location in another file		
7	Two Parts of Compilation		Analysis and Synthesis		
8	Analysis (Front end of Compiler)	Analysis part breaks the source program into constituent pieces and creates an intermediate representation			
9	Synthesis (Back end of Compiler)		Synthesis part takes the intermediate representation as input and transforms it to the target program.		
10	6 Phases of Compiler		1.Lexical analysis 2. Syntax analysis 3. Semantic analysis 4. Intermediate code generation 5. Code optimization 6. Code generation		
11	Lexical analysis (Scanner)		It accepts lexemes which produces token as output		
12	Token		Sequence of characters that can be treated as a single logical entity. Eg: Number, Identifiers ,keywords , etc		
13	Lexeme	Sequence of characters in the source program			
14	Pattern	Set of strings is described by a rule called a pattern associated with the token.			
15	Symbol Table		Data structure that contains a record for each symbol		
16	Syntax analysis (Parser)	accepts sequence tokens as input and produces parse tree as output			



17Intermediate representation $2$ Easy to translate into the target machine18Properties of code $>$ Three address code have atmost 3 operand19Use of Code Optimization $>$ Atmost 1 operator additional to = $>$ 20Goals of Error HandlerReport the presence of errors clearly and accurately.20Goals of Error HandlerReport the presence of errors clearly and accurately.21four common error-recovery $>$ 22Panic mode $>$ 23four common error-recovery $>$ 24four common error-recovery $>$ 25Panic mode $>$ 26Deterministic four Automate $>$ 27Panic mode $>$ 28Statement level. synchronizing token is found $>$ 29Panic mode $>$ 20Deterministic for a particular input character, the machine goes to or state only and null (or $\varepsilon$ ) move is not allowed $>$ 29Nondeterministic Finitei. a transition ii.move any number of states for a input.20LEXLexical Analysis21Erx (Context-free Grammata(NFA)i. a transition ii.move any number of states for a input.21Paricei. a transition ii.move any number of states for a input.22Panic and for a particular input character, the machine goes to or state only and null (or $\varepsilon$ ) move is not allowed23Secondary task of LAIncerta station ii.move any number of states for a input. <th></th> <th>Two properties</th> <th>It should be easy to produce</th> <th></th>		Two properties	It should be easy to produce	
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35     Reduction         Its right side of production   Process of replacing a string by an Non terminal according to a grammar production	34	Right derivation		
according to a grammar production	~ '			
according to a grammar production	35	Reduction		
36   Alias of reduction   reverse of derivation			according to a grammar production	
	36	Alias of reduction	reverse of derivation	
	50			

37	Yield	Leaf nodes of parse tree are concatenated from left to right to form the input string derived from a grammar	
38	Alias of yield	frontier	
39	Role of LEX	LEX translates a set of regular expression specifications into a C implementation of a corresponding finite state machine	
40	No. of sections in Lex program	three	
41	3 Sections	Declarations, Rules and Auxiliary functions	
42	Parser	parser takes input in the form of sequence of tokens and produces output in the form of parse tree	
43	Alias name for Syntax analysis	Hierarchical analysis or parsing	
44	No. of types of Parser	2	
45	Types of Parser	Top-down parser Bottom-up parser	
46	2 subtypes of topdown parser	Recursive descent parser Predictive parser	
47	Top-down parser	Parser builds parse tree from Root to Leaves	
48	Bottom-up parser	Parser builds parse tree from Leaves to Root	
49	Alias for predictive parser	Table driven parser or LL(1) Parser	
50	Conditions for Top down	Eliminating Left recursion & ambiguity Left factoring out Requires Backtacking	
		UNIT-III SYNTAX ANALYSIS	
51	Parse tree	A parse tree is a graphical representation of a derivation	
52	Properties of parse tree	root is labeled with Start symbol leaf is labeled with a token interior node is labeled by a non-terminal	
53	Ambiguous	A Grammar that produces more than one parse tree for some sentence using left most derivation / right most derivation	
54	Universal parsers	Cocke-Younger-Kasami algorithm and Earley's algorithm can parse any grammar	
55	Eliminating Left- Recursion	A context free grammar is said to be left recursive if it has a non terminal A with two productions in the following form $A \longrightarrow \beta A'$ $A \longrightarrow A' \longrightarrow \varepsilon   \alpha A'$	
56	Left factoring	process of factoring out the common prefixes of two or more production alternates for the same non-terminal	
57	Handle	A substring that matches the right side of a production called handle	

58	Handle pruning	Applying the production to the substring results	
59	Alias of Bottomup	in a right-sentential form.       rightmost derivations in reverse	
	parser		
60	SR parser	Shift Reduce parser	
61	4 operations in SR	Shift,Reduce, Accept and Error	
62	Shift	moving of symbols from input buffer onto the stack	
63	Reduce	RHS of production rule is popped out of stack and LHS of production rule is pushed onto the stack	
64	accept	successful parsing is done	
65	error	parser can neither perform shift action nor reduce action and not even accept action.	
66	Operator grammar	No Epsilon production and consecutive Non terminals	
67	Operator precedence parser	Bottom-up parser that interprets on operator grammar	
68	Precedence relations	a > b $\rightarrow$ "a" has the higher precedence than terminal "b". a < b $\rightarrow$ "a" has the lower precedence than terminal "b". a $\doteq$ b $\rightarrow$ "a" and "b" both have same precedence.	
69	LR(K) parser	"L" stands for left-to-right scanning of the input. "R" stands for constructing a right most derivation in reverse. "K" is the number look ahead symbols	
70	SLR parser	Simple LR parser	
71	CLR parser	Canonical LR parser	
72	LALR parser	Lookahead LR parser	
73	Most powerful parser	Canonical LR parser	
74	Advantages of OPP	<ul> <li>simplicity.</li> <li>easy to construct.</li> <li>Powerful that can be used for the programming language expressions</li> </ul>	
75	Disadvantages of OPP	<ul> <li>grammar of small class</li> <li>difficult to identify or decide that grammar recognized which language.</li> <li>not capable of handling the unary minus.</li> </ul>	
	UNIT-J	IV INTERMEDIATE CODE GENERATION	
76	Advantages of Machine independent intermediate form	Retargeting is facilitated. A machine independent code optimizer can be applied.	
77	Types of Intermediate languages	<ul> <li>Syntax Tree.</li> <li>Postfix Notation.</li> <li>Three Address code.</li> </ul>	

78	Syntax tree	condensed form of parse tree.	
79	DAG	Directed Acyclic Graph	
80	Postfix notation	Traverse left child,right child,and root	
81	General form of Three address code	X:=Y op Z	
82	Implementation of Three address code	<ul> <li>Quadruple.</li> <li>Triples</li> <li>Indirect Triples</li> </ul>	
83	Quadruples	Quadruples has four fields: op,arg1, arg2 and result.	
84	Triples	Triples has Three fields: op, arg1 and arg2	
85	Indirect triples	In addition to triples use a list of pointers.	
86	Pros of quadruples	Easy to rearrange code for global optimization	
87	Cons of quadruples	Lots of temporaries	
88	Use of Boolean expression	Alter the flow of control. Compute logical values	
89	Back patching	activityof filling up unspecified information of labels using appropriate semantic actions in during the code generation process.	
90	Functions of back patching	makelist(i) Merge(p1,p2) Backpatch(p,i)	
91	M.quad	M.quad records the number of the first statement of E2.code.	
92	Declaration	The process of declaring keywords, procedures, functions, variables, and statements with proper syntax	
93	Intermediate code generation	interface between front end and back end in a compiler	
94	DAG definition	tool that depicts the structure of basic blocks, helps to see the flow of values flowing among the basic blocks	
95	Use of DAG	DAG provides a good way to determine the common sub-expression.	
96	Procedure	A procedure returns the control but not any value to calling function or code.	
97	Function	A function returns a value and control to calling function or code.	
98	Calling function	Calling function contains the input (the actual parameters) which is given to the called function	
99	Called function	called function which then works on them because it contains the definition, performs the procedure specified and returns if anything is to be returned.	
100	Assignment statement	Assignment statements enable the programmer to define or redefine a symbol by assigning it a	

		value		
	UNIT-V CO	DE OPTIMIZATION AND CODE GENERATION		
101	Directed Acyclic Graph	DAG is similar to syntax tree but identify the common sub expression		
102	Basic block	sequence of consecutive statements in which flow of control enters at the beginning and leaves at the end without halt		
103	Dead code	Dead (or useless) code statements that compute values that never get used.		
104	Flow graph	A graph representation of three-address statements in which Nodes are basic block, and the edges represent the flow of control		
105	Copy Propagation	process of replacing the occurrences of targets of direct assignments with their values y=x $z=3+y \rightarrow z=3+x$		
106	Constant Folding	Deducing at compile time that the value of an expression is a constant and using the constant instead		
107	Code Motion	Modification that decreases the amount of code in a loop		
108	Reduction In Strength	replacing an expensive operation by a cheaper one		
109	Absolute machine language	program can be placed in a location in memory and immediately executed		
110	Relocatable machine language	program allows subprograms to be compiled separately. A set of relocatable object modules can be linked together and loaded for execution by a linking loader		
111	Loop unrolling (loop unwinding)	Loop unrolling increases the program's speed by eliminating loop control instruction and loop test instructions.		
112	Classes of local transformations	<ul> <li>structure-preserving transformations</li> <li>algebraic transformations.</li> </ul>		
113	Structure- preserving transformations	<ul> <li>common sub-expression elimination</li> <li>dead-code elimination</li> <li>renaming of temporary variables</li> <li>interchange of two independent adjacent statements</li> </ul>		
114	Inner Loop	A loop that contains no other loops is called an inner loop		
115	Local common sub-expression.	An occurrence of an common sub-expression within a block		
116	Global common sub-expression	An occurrence of an common sub-expression between the blocks	between the blocks	
117	Addressing mode	Way in which location of the operand may be specified		
118	Immediate addressing	Operand value should be specified as part of instruction. (#)		
119	Indirect addressing	address specified in the instruction are themselves an address (@)		
120	Register descriptor	register descriptor containing the list of variables currently stored in this register		

121	Address descriptor	address descriptor containing the list of locations	
122	Getreg function	where this variable is currently stored           determine the location L where the result of the	
computation y op z should be stored		computation y op z should be stored	
123	Types of Jump	Conditional jump UnConditional jump	
123	statement		
		Optimization is a program transformation	
124	Code optimization	technique, which tries to improve the code by	
124	Code optimization	making it consume less resources and deliver	
		high speed.	
125	Code generation	Last phase is used to produce the target code for three-address statements	
		TECHNICAL QUESTIONS	
126	Cross Compiler	compiler run on one machine and produce target code for another machine	
		The set of prefixes of right sentential forms	
127	Viable prefixes	that can appear on the stack of a shift- reduce	
127	viable prefixes	parser viable prefixes.	
		The set of items which include the initial item,	
128	Kernel items	$S' \rightarrow .S$ , and all items whose dots are not at the	
-		left end	
129	Non kernel items	The set of items, which have their dots at the left	
12)		end	
		It is a process of Compiler which should	
130	Type checking	report an error if an operator applied to an incompatible operand.	
		incompatible operand.	
131	Static checking	the type of variable is known at compile time	
132	Dynamic checking	the type of variable is known at runtime	
133	Input buffering	Technique used to store input string for increasing Compiler speed	
	Deefferrrein	Two buffers are used to store the input string. The	
134	Buffer pair	first buffer and second buffer are scanned	
		alternately.	
135	Sentinels	Special character that is not part of the source	
		program           The parse tree containing the values of attributes at	
136	Annotated parse	each node for given input string is called annotated	
	tree	parse tree.	
		A form of recursive-descent parsing that does not	
137	predictive parser	require any back-tracking is known as	
		predictive parser       A control flow graph depicts how the	
100		program control is being passed among the blocks.	
138	Control flow	It is a useful tool that helps in optimization by help	
		locating any unwanted loops in the program.	
139	Boolean	Expressions which are composed of the Boolean	
	expression	operators (and, or, and not) applied to elements	
140	Short circuit code	We can also translate a Boolean expression into three-address code without generating	
110		code for any of the Boolean operators	
	1 I		

141	Three address code	It contains three addresses, two for operands and one for the result.		
142	LL grammar	L" stands for left-to-right scanning of the input. "L" stands for constructing a Left most derivation		
143	Stack	Stack is a linear data structure which follows Last in first out (LIFO) order in which the operations are performed		
144	2 pointers in input buffering	Forward pointer Lexeme beginning		
145	Forward pointer		scans ahead until a match for a pattern is found.	
146	Lexeme beginning	points to the beginning of the current lexeme which is yet to be found.		
147	Grouping of phases	Front end Back end	Front end	
148	Usage of sentinel	reduces the two tests to one by extending each buffer half to hold a sentinel character at the end.		
149	Backtracking		if one derivation of a production fails, the syntax analyzer restarts the process using different rules of same production.	
150	Recursive Descent parser		Top-down method of syntax analysis in which a set recursive procedures to process the input is executed	
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