GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2021
COMPILER DESIGN
CS604A

TIME ALLOTTED: 3HR **FULL MARKS:70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No
1.	(i)	Which of the following is not a phase of compiler? a) syntax b) lexical c) testing d) code generation	1	CO3
	(ii)	firstpos of **concatenate** node with left child c1 and right child c2 is a) firstpos(c1) ∪ firstpos(c2) b) firstpos(c1) ∩ firstpos(c2) c) if (nullable(c1)) firstpos(c1) ∪ firstpos(c2) else firstpos(c1) d) if (nullable(c2)) firstpos(c1) ∪ firstpos(c2) else firstpos(c1)	1	CO2
	(iii)	Which of the following software tool is a lexical analyzer generator? a) Lex b) Yacc c) Both Lex and Yacc d) Neither Lex nor Yacc	1	CO2
	(iv)	The grammar E -> E+E | E*E | id is a) ambiguous b) unambiguous c) not given sufficient information d) none of these	1	CO3
	(v)	Which of the following statements is false? a) An unambiguous grammar has same left most and right most derivation b) An LL(1) parser is a top-down parser c) An LR(1) parser is a bottom-up parser d) An ambiguous grammar can never be LR(k) for any k	1	CO3
	(vi)	……data structures is used for shift reduce parsing a) Pointer b) Array c) Stack	1	CO1

d) Queue

(vii)	A useful data structure for automatically analyzing basic blocks is a) Control flow graph (CFG) b) Directed acyclic graph (DAG) c) Hash Table d) Linear List	1	CO4
(viii)	Which of the following is true? a) The complement of recursive language is recursive b) The complement of recursively enumerable language is recursively enumerable c) The complement of recursive language is either recursive or recursively enumerable d) The complement of context free language is context free	1	CO2
(ix)	Annotated Parse tree is generated in the phase of a) Syntax Analysis b) Semantic Analysis c) Code Optimization d) Intermediate Code Generation	1	CO3
(x)	Terminal table a) contains all constants in the program. b) is a permanent table of decision rules in the form of patterns for matching with the uniform symbol table to discover syntactic structure. c) consist of a full or partial list of the token is as they appear in the program created by lexical analysis and used for syntax analysis and interpretation. d) is a permanent table which lists all keywords and special symbols of the language in symbolic form		CO3
(xi)	Type checking is normally done during a) Lexical analysis b) Syntax analysis c) Syntax directed translation d) Code optimization	1	CO1
(xii)	Three Address code involves a) At least 3 addresses b) At most 3 addresses c) Exactly 3 addresses d) Ternary operator	1	CO4

GROUP – B
(Short Answer Type Questions)

Answer any ***three*** from the following: **3 × 5 = 15**

			Marks	**CO No.**
2.	a)	Write down the difference between Compiler and Interpreter	1	CO2
	b)	Write down the output of each phase for the expression		CO1

		a: = b + c *50	4	
		[Assume a, b and c are real numbers]		
3		E → T | E+T T → F | T*F F → V | (E) V → a | b | c |d Generate the parse tree for a + b * c	5	CO1
4.	a)	What is a handle?	2	CO3
	b)	Consider the Grammar: E → E+E | E*E | id Find the handles of the right sentential forms of reduction for the string: **id + id * id**	3	CO3

5.		Generate the three address code for the following code:
		while(A<C and B>D) do
		if A=1 then C=C+1
		else
		while A<=D do
		A=A+3
			5	CO4

6.		What is activation record? Explain clearly the components of activation record.	5	CO3

GROUP – C
(Long Answer Type Questions)
Answer any ***three*** from the following: **3 × 15 = 45**

			Marks	**CO No.**
7.	a)	Compute the collection of sets of LR(0) item sets for the following grammar. **E → E+T | T** **T → T*F | F** **F → a | b**	10	CO3
	b)	Construct the SLR parsing table using the SLR algorithm.	5	CO3
8.	a)	Consider the following grammar: E->E+T/T T->T*F/F F->(E)/id Obtain the FIRST and FOLLOW sets for the above grammar. Construct the predictive parsing table of the above grammar.	9	CO2
	b)	Consider the grammar: S-> AaAb|BbBa A-> Є B-> Є Check the above grammar is LL(1) or not?	4	CO3
	c)	What is annotated parse tree?	2	CO3
9.	a)	Translate the expression **a = – b * (c + d / b) – (e * f)**	8	CO2

into

i) Quadruple ii) Triple iii) Indirect Triple
iv) 3-address code

	b)	What is an operator precedence parser ?	2	CO2
	c)	List the advantages and disadvantages of operator precedence parsing.	3	CO3
	d)	Translate the expression: **a* (b + c / d)** into syntax tree.	2	CO2
10.	a)	List out the basic blocks and draw the flow graph for the following code :	6	CO4

```
w  = 0;
x = x + y;
y = 0;
if ( x ≥ z)
{
        y = x;

        x++;
}
else
{
        y = z;

        z++;
}
w = x + z;
```

	b)	Consider some inter block code optimization without any data flow analysis by treating each extended basic block as if it is basic block .Give algorithms to the following optimizations within an extended basic block. In each case, indicate what effect on other extended basic blocks a change within one extended basic block can have. i) Common sub-expression elimination ii) Constant folding iii) Copy propagation	9	CO4
11.		Write short note of any three from the following: **3 x 5 = 15**	3X5=15	
	a)	NFA and DFA	5	CO2
	b)	LEX and YACC	5	CO4
	c)	Symbol Table	5	CO3
	d)	Input Buffering	5	CO4
	e)	Synthesized attribute and inherited attribute	5	CO4
	f)	Peephole Optimization	5	CO4