

# GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2020-2021

COMPILER CONSTRUCTION

PGCSE 302D

TIME ALLOTTED: 3 HOURS

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: **0×1=10**

		Marks	CO No
1.	i) Relocating bits used by relocating loader are specified by _____ a) Relocating loader itself                      b) Linker c) Assembler    d) Macro Processor	1	CO1
	ii) Compiler translates the source code to a) Executable code                                      b) Machine code c) Binary code    d) Both b and c	1	CO3
	iii) The grammar $A \rightarrow AA \mid (A) \mid e$ is not suitable for predictive-parsing because the grammar is? a) Ambiguous    b) Left recursive c) Right recursive                                      d) An operator grammar	1	CO2
	iv) Which of the following describes a handle (as applicable to LR-parsing) appropriately? a) Position where next reduce or shift operation will occur b) The next step has use of Non-terminal for reduction c) Used for reduction in a coming-up step along with a position in the sentential form where the next shift or reduce operation will occur d) Used in the next step for reduction along with a position in the sentential form where the right hand side of the production may be found	1	CO3
	v) Which of the following groups is/are token together into semantic structures? a) Syntax analyzer                                      b) Intermediate code generation c) Lexical analyzer                                      d) Semantic analyzer	1	CO1
	vi) Which of the following statements is false? a) Unambiguous grammar has both kind of derivations b) An LL(1) parser is a top-down parser c) LALR is more powerful than SLR d) Ambiguous grammar cannot be LR(k)	1	CO4
	vii) What is the output of lexical analyzer? a) A parse tree    b) A list of tokens c) Intermediate code                                      d) Machine code	1	CO2

viii)	YACC builds up _____ a) SLR parsing table c) LALR parsing table	b) Canonical LR parsing table d) None of these	1	CO4
ix)	_____ is a process of finding a parse tree for a string of tokens. a) Parsing c) Recognizing	b) Analysing d) Tokenizing	1	CO3
x)	What is the action of parsing the source program into proper syntactic classes? a) Syntax analysis c) Lexical analysis	b) General syntax analysis d) Interpretation analysis	1	CO2
xi)	Which grammar rules violate the requirements of an operator grammar? 1. $P \rightarrow QR$ 2. $P \rightarrow QsR$ 3. $P \rightarrow \epsilon$ 4. $P \rightarrow QtRr$		1	CO3
	a) 1 only c) 2 and 3 only	b) 1 and 3 only d) 3 and 4 only		
xii)	A grammar that produces more than one parse tree for some sentence is called as a) Ambiguous c) Regular	b) Unambiguous d) All of these	1	CO2

**GROUP – B\***

**(Short Answer Type Questions)**

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

		<b>Marks</b>	<b>CO No</b>
2.	a) What is 'handle' and 'handle pruning'? Give a suitable example of this.	2	CO1
	b) Consider the grammar : $E \rightarrow E + E \mid E * E \mid id$ For a sentence $id + id * id$ , write the handles in the right – sentential form of the reduction.	2	CO2
	c) What is predictive parsing?	1	CO1
3.	Translate the expression : $(x - y) * (z + d) + (x + z + d)$ into i) quadruples ii) triples iii) indirect triples	5	CO4
4.	Write down the output of each phase for the expression $a: = b - c / 50$	5	CO2
5.	We have a grammar with not epsilon and unit production (i.e. of type $S \rightarrow \epsilon$ and $S \rightarrow a$ ) to parse a string, with n tokens. What is the maximum number of reduces moves that can be taken by a bottom-up parser for this grammar? Justify your answer.	5	CO4



- c) Construct the DAG (Directed Acyclic Graph) for the following basic block : 5 CO3
- $$\begin{aligned}
 d &:= y * z \\
 e &:= x + y \\
 y &:= y * z \\
 x &:= e - d
 \end{aligned}$$
11. a) The instructions of a simplified computer, which has only two registers, are given below: 6 CO4
- OP Rj, Rk - Performs Rj OP Rk and stores the result in register Rk.  
 OP m, Rj - Performs the content of memory location m OP Rj and stores the result in Rj  
 MOV m, Rk - Moves the content of memory location m to register Rk.  
 MOV Rk, m - Moves the content of register Rk to memory location m.  
 OP is either ADD or SUB.
- We have the following basic block:
- $$\begin{aligned}
 T1 &= a + b \\
 T2 &= c + d \\
 T3 &= e - T2 \\
 T4 &= T1 - T3
 \end{aligned}$$
- Assuming that all operands are initially in memory and the final value of the computation in memory.  
 What is the minimum number of MOV instructions in the code generated for this basic block ?
- b) Consider the grammar G, whose SLR parser has q1 states and LALR parser has q2 states. What is the relation between q1 and q2? 4 CO3
- c) Why is the code optimizations are carried out on the intermediate code? 5 CO4