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RV COLLEGE OF ENGINEERING®

(An Autonomous Institution Affiliated to VTU)

V Semester B. E. Examinations April/May -2024

Information Science and Engineering

COMPLIER DESIGN

Time: 03 Hours ***Maximum Marks: 100***

Instructions to candidates:

1. Answer all questions from Part A. Part A questions should be answered in first three pages of the answer book only.
2. Answer FIVE full questions from Part B. In Part B question number 2, 7 and 8 are compulsory. Answer any one full question from 3 and 4 & one full question from 5 and 6.

PART-A

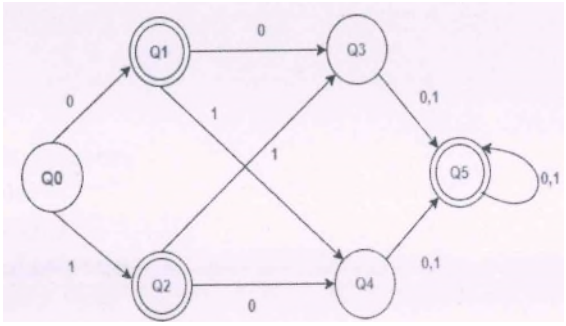
			M	BT	CO
1	1.1	The number of tokens in the following C statement is: $printf("i = \%d, \&i = \%x", i, \&i);$	01	1	1
	1.2	Eliminate left recursion from the following grammar. $E \rightarrow E + T \mid T$ $T \rightarrow T * F \mid F$ $F \rightarrow (E) \mid id$	02	2	1
	1.3	List any four error recovery strategic that a parser can employ.	02	1	1
	1.4	File produced by $YACC$ and used by lex is _____.	01	2	2
	1.5	Define Kernel and Non-kernel Items.	02	1	2
	1.6	Give an example for $LALR$ parser generator.	01	1	1
	1.7	Write the Tripe representation for the given three address code: $T1 = e \uparrow f$ $T2 = b \times c$ $T3 = T2/T1$ $T4 = b \times a$ $T5 = a + T3$ $T6 = T5 + T4$	02	2	2
	1.8	Given the following $ACTION/GOTO$ table, perform a parse of "a", assuming 0 as the start state. Show the contents of the stack, remaining input, and action performed at each step of the shift-reduce parse.			

$State$	A	\$	A	B
0	$Shift\ 1$	$Reduce\ B \rightarrow \varepsilon$	2	3
1	$Shift\ 3$	$Reduce\ A \rightarrow a$	0	
2		$Accept$	3	0
3	$Shift\ 1$	$Accept$		1

		02	2	1
1.9	List the primary tasks of code generator.	02	1	1
1.10	List the performance metrics to be considered while designing garbage collection.	02	1	1
1.11	The quality of generated code is determined by _____ and _____.	01	2	2

	1.12	Consider the intermediate code given below. i) $i = 1$ ii) $j = 1$ iii) $t1 = 5 * i$ iv) $t2 = t1 + j$ v) $t3 = 4 * t2$ vi) $t4 = t3$ vii) $a[t4] = -1$ viii) $j = j + 1$ ix) $if\ j \leq 5\ goto$ (iii) x) $i = i + 1$ xi) $if\ i < 5\ goto$ (ii) Identify the leaders.	02	2	2

PART-B

2	a	In addition to a compiler, several other programs may be required to create an executable target program. Describe all such programs required to convert a source program to an executable target program.	06	2	1
	b	Define distinguishable and indistinguishable states. Identify the same and thereby minimize the DFA (fig 2b) using table filling algorithm.  Fig 2b	10	2	1
3	a	Construct LR Parsing table for the below context free grammar. $S \rightarrow AA$ $A \rightarrow aA \mid b$	08	3	2
	b	Write an algorithm for LR-Parsing. With the help of schematic diagram discuss the features of LR parser.	08	1	2
		OR			
4		Consider the grammar $S \rightarrow AS \mid \epsilon$ $A \rightarrow 0A1 \mid B$ $B \rightarrow B1 \mid 01$ i) Construct the Canonical LR sets of items for the grammar. ii) Show the construction of $LALR$ parsing table. iii) Show the sequence of moves made by the parser for the string 001101.	16	3	2
5	a	Construct the DAG for the basic block $y = u * v$ $x = v + w$ $v = v + w$ $u = y/x$ $x = x - u$			

		Simplify the above three address code assuming i) Only z is live on exit from the block. ii) u and v are live on exit.	06	4	3
	b	Define Synthesized Attribute and Inherited Attribute. The following grammar generates dotted binary numbers. Design an S-attributed SDD to compute S.val, the decimal number value of an input string. For example the translation of string 101.10 should be the decimal number 5.5. Construct an annotated parse tree to translate a string 1010.11 to its equivalent decimal number. $S \rightarrow L1.L2$ $L \rightarrow LB \mid B$ $B \rightarrow 0 \mid 1$	10		
		OR			
6	a	Define the following: i) Three address codes ii) Quadruples iii) Indirect triples iv) Annotated parse tree v) Dependency graph Translate the arithmetic expression $a + b * c/e + f - b * d$ into x) A Syntax tree y) Quadruples z) Indirect triples	08	3	3
	b	Give the SDD to process a sample variable declaration D in 'C' language consisting of a basic type T followed by a list L of identifiers. T can be int or float. Construct the dependency graph for the input. $Float\ a, b, c$	08	3	3

7	a	Derive activation record. Draw the stepwise (for each call of function fact()) stack activation record for the following code when $n = 3$.
		$int\ fact\ (int\ n)$
		{
		$if(n == 0)$
		$return\ 1;$
		$x = fact(n - 1);$
		$return\ x;$
		}
			10	2	4

	b	Briefly explain the issues in the design of a code generation process.	06	2	4
8	a	Translate the given program into three-address statements. Assume that the array entries are numbers the requires 4 bytes. i) List the rules for partitioning the three-address codes into basic blocks. ii) Identify the basic blocks iii) Construct the flow graph for the three- address code iv) Identify the loops in the flow graph.			

	begin $prod \coloneqq 0;$ $i \coloneqq 1;$ *do begin* $prod \coloneqq prod + a[i] * b[i];$ $i \coloneqq i + 1;$ *end* *while* $i \leq 20$ *end*	10	3	4
b	Explain different loop optimization techniques.	06	2	3