

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL (A constituent unit of MAHE, Manipal)

## **VI SEMESTER B.TECH. COMPUTER SCIENCE AND ENGINEERING END SEMESTER EXAMINATIONS, APRIL 2018**

SUBJECT: COMPILER DESIGN (CSE 3201)

**REVISED CREDIT SYSTEM** (18-04-2018)

Time: 3 Hours		's MAX. MARKS: 5	50
		Instructions to Candidates:	
	* *	Answer <b>ALL</b> the questions. Missing data may be suitably assumed.	
1A.	Show the output of the various phases of compiler for the following assignment statement. z=(a+b*c)+2+(a+b*c)		3M
1 <b>B</b> .	Describ	e the reasons why the analysis portion of a compiler is separated into lexical analysis sing phases	2M
1C.	Give the transition diagram for recognizing comments in C language. Explain with a neat diagram how a lex program is used to fragment the input program into tokens using a finite automaton simulator.		
2A.	For the i. ii.	following Grammar G, Compute the FIRST and FOLLOW. Construct the parsing table using the predictive parsing LL(1) method.	4M
	$S \rightarrow aA$ $A \rightarrow AS$ $B \rightarrow Sa$ $C \rightarrow Sf$ $D \rightarrow aE$ $Gramm$	BbCD   ε Sd   ε c   hC   ε   Cg BD   ε mar G	
2B.	Explain	any two issues in the design of code generation.	2M
2C.	Constru S -> S - Gram	Let the canonical set of LR(1) automaton for the Grammar A. $\frac{-S \mid (S) \mid num}{nar A}$	<b>4M</b>
3A.	For the i. ii.	following Grammar B, Construct the LR(0) automaton. Construct the SLR(1) parsing table and determine if this grammar is SLR(1). Justify.	5M
	E -> E - T -> TF F -> F* Gram	$ \begin{array}{c} + T \mid T \\ \hline \mid F \\   (E) \mid a \mid b \mid e \\ \hline \text{mar } B \end{array} $	

Show the stack contents, symbols, the input and the actions used during parsing for the input **3B. 3M** string "(ab+a)\*b" using the table obtained in question 3A.

- **3C.** Write a short note on Peephole optimization.
- **4A.** Construct Three Address Code for the following C code snippet. **Note** array element takes 4 **4M** bytes.

```
i= m-1; j =n; v = a[n];
while(1)
{
    do i = i + 1; while (a[i] < v);
    do j = j - 1; while (a[j] > v);
    if (i >= j) break;
    x = a[i]; a[i] = a[j]; a[j] = x;
}
x=a[i]; a[i] = a[n]; a[n] = x;
```

**4B.** Write an algorithm whose output should be the list of basic blocks for the sequence in which each instruction is assigned to exactly one basic block. Also draw the flow graph for the three address code obtained in question 4A.

**4C.** Write the quadruple for the C-code segment, **Note** – array element takes 4 bytes.

i. a = b[i] + c[i]

ii. x = \*p + &y;

- 5A. Write a LEX program that finds the length of the longest word in the input. 3M
- 5B. Suppose the quicksort program shown uses a partition function that always picks a[m] as the separator v. When the array a[m],...,a[n] is reordered, assume that the order is preserved as much as possible. That is, first come all the elements less than v, in their original order, then all elements equal to v, and finally all elements greater than v, in their original order. int a[11]: void quicksort( int m, int n) {

int a[11],	vola quickbort ( int in, int ii)
void readArray() { /* Reads 9 integers into	int I;
a[1]a[9] */	if( n>m) {
int I;	i = partition (m,n);
}	quicksort(m, i-1);
int partition( int m, int n) {	quicksort (i+1, n);
/* Picks a separator value v, and partitions	}
a[mn] so that a[mp-1] are less than v,	}
a[p] = v and $a[p+1n]$ are equal to or greater	main() {
than v. Returns p */	readArray();
}	a[0]= -9999;
	a[10] = 9999;
	quicksort(1,9);
	}

- i. Draw the activation tree when the numbers 9, 8, 7, 6, 5, 4, 3, 2, 1 are sorted.
- ii. What is the largest number of activation records that ever appear together on the stack?
- 5C. Give the annotated parse tree for the expression "4\*5\*3\*(5+5)n" clearly showing the 5M propagation of attributes between the different nodes of the tree. Give the semantic rules for all the productions of the Grammar C.

 $L \rightarrow En$   $E \rightarrow TE'$   $E' \rightarrow +TE' \mid \varepsilon$   $T \rightarrow FT'$   $T' \rightarrow *FT' \mid \varepsilon$   $F \rightarrow (E) \mid digit$ Grammar C

\*

**3M**