29. a. Construct predictive parser for the following grammar G

$E \rightarrow E+T \mid T$

$T \rightarrow T*F \mid F$

$F \rightarrow (E) \mid id$

And parse the input string $id*id*id$.

(OR)

b. Construct the LALR parsing table for the grammar,

$S \rightarrow L=R \mid R$

$L \rightarrow *R \mid id$

$R \rightarrow L$

30. a.i. Give the syntax directed definition for flow of control statements. (8 Marks)

ii. Write the three address code for the expression $a < b$ or $c < d$ and $e < f$. (4 Marks)

(OR)

b.i. What are the various methods of implementing three address statements? Explain with example. (8 Marks)

ii. Translate the arithmetic expression $a*-(b+c)$ into syntax tree and postfix notation. (4 Marks)

31. a.i. Discuss briefly about simple code generation algorithm. (8 Marks)

ii. How to generate a code for a basic block from its DAG representation? (4 Marks)

(OR)

b. Write in detail about the issues in the design of a code generator.

32. a. Explain the various storage allocation strategies with suitable example.

(OR)

b. Explain the principal sources of optimization with necessary example.

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Reg. No.															

B.Tech. DEGREE EXAMINATION, NOVEMBER 2018

3rd to 7th Semester

15CS314J – COMPILER DESIGN

(For the candidates admitted during the academic year 2015 - 2016 to 2017 - 2018)

Note:

(i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45th minute.

(ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours Max. Marks: 100

PART – A (20 × 1 = 20 Marks)

Answer **ALL** Questions

1. Which type of grammar is used in the lexical analysis phase?
   (A) Regular grammar (B) Context free grammar
   (C) Context-sensitive grammar (D) Unrestricted grammar

2. If the regular expression is $(a \mid b)d^*$ then the language is represented by .
   (A) *dd* (B) *abd*
   (C) *adb* (D) *bdddd*

3. The function of ∈-closure(s)
   (A) Finds the set of all states reachable from S on an input symbol (B) Finds the next state reachable from the state S on an input symbol
   (C) Finds the set of all states reachable from S on ∈ input (D) Finds the next state reachable from the state S on ∈ input

4. If L_1 is represented by $(a \mid b \mid c)^* de$ and L_2 is represented by $(0 \mid 1 \mid 2)^* 34$, then choose the right string that is generated by L_1 L_2
   (A) *ae 234* (B) *abcccde 0011234*
   (C) *abcccde 1232* (D) *de 223*

5. Consider the following Grammar: S→FR, R→S|∈, F→id. In predictive parser table, M of the grammar, the entries M[S, id] and M[R, $] respectively.
   (A) {S→FR} and {R→ϵ} (B) {S→FR} and { }
   (C) {S→FR} and {R→*S} (D) {F→id} and {R→ϵ}

6. The grammar S→CC, C→cC|d is
   (A) LL(1) (B) SLR(1) but not LL(1)
   (C) LALR(1) but not SLR(1) (D) LR(1) but not LALR(1)

7. Which of the following parser is the most powerful?
   (A) Operator precedence (B) Canonical LR
   (C) LALR (D) SLR

8. A shift reduce parser carries out the actions specified within braces immediately after reducing with the corresponding rule of the grammar. *S→xxW {Print "1"}, S→y {print "2"}, W→Sz{Print "3"}* what is the translation of *"xxxxyzz"*?
   (A) 11231 (B) 11233
   (C) 23131 (D) 233321

9. Synthesized attributes of a node in the parse tree computed
   (A) From the attributes of the left sibling (B) From the attributes of the right sibling
   (C) From the attributes of the root node (D) From the attributes of the children

10. The polish notation of the expression $a+(b*c)/d$ is
   (A) $abcd*/+$ (B) $abc*d+/$
   (C) $abc*d/+$ (D) $abc*+d/$

11. Type checking is normally done during
   (A) Lexical analysis (B) Syntax analysis
   (C) Syntax directed translation (D) Code generation

12. Back patching is useful for handling
   (A) Condition jumps (B) Unconditional jumps
   (C) Backward reference (D) Forward references

13. Which of the following code is faster?
   (A) Mov R_0, a (B) Mov R_0, R_1
   (C) Mov a, R_0 (D) Mov R_1, a

14. Reduction in strength
   (A) Weakens the processor's processing capability (B) Saves memory space
   (C) Runs faster (D) Runs slower

15. Consider the following code segment
   $x=u-t;$
   $y=x*v;$
   $x=y+w;$
   $y=t-z;$
   $y=x*y;$
   The minimum number of total variable required to convert the above code segment to static single assignment form is
   (A) 6 (B) 8
   (C) 7 (D) 10

16. The languages that need heap allocation in the runtime environment are
   (A) Those that use global variables (B) Those that use dynamic sloping
   (C) Those that support recursion (D) Those that allow dynamic data structure

17. Code motion moves
   (A) All instructions in the loop outside the loop (B) Loop invariant instruction outside the loop
   (C) All instructions in the loop into the pre-header of the loop (D) Loop-invariant instructions in the loop into the pre-header of the loop

18. A flow graph connecting various blocks is meant to
   (A) Graphically flow information in the compiler (B) Maintain data information and distribute to various blocks on need basis
   (C) Block the flow of information (D) Flow away all the information

19. Peephole optimization is a form of
   (A) Loop optimization (B) Local optimization
   (C) Constant folding (D) Data flow analysis

20. Local and loop optimization in turn provide motivation for
   (A) Data flow analysis (B) Constant folding
   (C) Peephole optimization (D) DFA and constant folding

PART – B (5 × 4 = 20 Marks)
Answer **ANY FIVE** Questions

21. Identify the lexeme that make up the tokens in the following program segment. Indicate the corresponding token and pattern

```
void swap (int i, int j)
{
    int t;
    t = i;
    i = j;
    j = t;
}
```

22. Consider the grammar
   $S\rightarrow$ A|B, $A\rightarrow 0A|\in$, $B\rightarrow 0B|1B|\in$
   Find the leftmost derivation, right most derivation and parse tree for the string 00101.

23. Check whether the given grammar $S\rightarrow aSbS|bSaS|\in$ is ambiguous.

24. Define DAG. Construct DAG for the expression $a+a*(b-c)+(b-c)*d$.

25. Define three address code. What are the types of three-address statements?

26. What are the structure preserving transformations on basic block?

27. What are the actions performed by the code generation algorithm?

PART – C (5 × 12 = 60 Marks)
Answer **ALL** Questions

28. a. Explain in detail the process of compilation. Illustrate the output of each phase of compilation for the input $a=(b+c)*(b+c)*2$.

(OR)

b. Construct minimum state DFA for the regular expression $(a|b)^*a(a|b)$.