M.TECH/CSE/3RD SEM/CSEN 6153/2016

COMPILER
(CSEN 6153)

Time Allotted : 3 hrs **Full Marks : 70**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 5 (five) from Group B to E, taking at least one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A
(Multiple Choice Type Questions)

1. Choose the correct alternative for the following: **10 × 1 = 10**

(i) Intermediate code generation phase gets input from
(a) lexical analyzer (b) Syntax analyzer
(c) Semantic analyzer (d) Error handling.

(ii) YACC builds up
(a) SLR Parsing table (b) LALR Parsing table
(c) Canonical LR Parsing table (d) None of the above.

(iii) The optimization technique which is typically applied on loops is
(a) removal of invariant computation (b) peephole optimization
(c) constant folding (d) all of these.

(iv) A Top-Down Parser generates
(a) left most derivation (b) right most derivation in reverse
(c) right most derivation (d) none of these.

(v) Which one of the following statement is false for the SLR (1) and LALR (1) parsing tables for a context free grammar?
(a) The reduce entries in both the tables may be different
(b) The error entries in both the tables may be different
(c) The go to part of both tables may be different
(d) The shift entries in both the tables may be identical.

(vi) We have the grammar E->E + n | E x n | n. The handles in the right-sentential form of the reduction for a sentence n + n x n are
(a) n, n + n and n + n x n (b) n, E + n and E x n
(c) n, E + n and E + E x n (d) n, E + n and E + n x n.

(vii) If *x* is a terminal, then *FIRST{x}* is
(a) ϵ (b) {x} (c) x* (d) none of these.

(viii) A parse tree showing the values of attributes at each node is called in particular
(a) Syntax Tree (b) Annotated Parse Tree
(c) Syntax Directed Parse Tree (d) Direct Acyclic Graph.

(ix) {S, A, B} is the non-terminal alphabet and {a, b} is the terminal alphabet of the CFG. S is the start symbol. The set of production rules are given below,
S->aB S->bA
B->b A->a
B->bS A->aS
B->aBB A->bAA
(a) aabbbb (b) abbbba (c) aabbab (d) aaaabb.

(x) A compiler that runs on one machine and produces code for a different machine is called
(a) Cross compiler (b) One pass compiler
(c) 2 pass compiler (d) none of these.

Group – B

2. (a) Construct the DFA for the regular expression (a* |b*)* abb (a|b)*.

(b) Draw a transition diagram for relational operators (=, <, >, <=, >=).

(c) Consider the following statement and find the number of tokens with type and value as applicable:

```
void main ()
{
    int x;
    x = 3;
}
```

(d) Write a short note on symbol table.

3 + 3 + 3 + 3 = 12

3. (a) Convert the following statement into tokens:
if (x>3) then y=5 else y=10;

(b) What do you mean by a handle? Give example.

(c) What is the reduce-reduce conflict in LR parser? Explain with an example.

(d) What is left recursion? Give example.

4 + 3 + 3 + 2 = 12

Group – C

4. (a) $S \rightarrow SS + \mid SS * \mid a$
(i) Show how the string aa + a* can be generated by this grammar.
(ii) What language does this grammar generate?

(b) Consider the following grammar and construct the SLR parsing table
$E \rightarrow E + T \mid T$
$T \rightarrow TF \mid F$
$F \rightarrow F * \mid a \mid b$

(2 + 2) + 8 = 12

5. Consider the following grammar:
$S \rightarrow aABb$
$A \rightarrow c \mid \epsilon$
$A \rightarrow d \mid \epsilon$
Prove the above grammar is LL(1)
Draw the parsing table.
Now check whether the string "ab" and "acdb" are the languages of the above grammar.
(Derive each step with the help of a stack)

(3 + 5 + 4) = 12

Group – D

6. (a) Translate the expression a = -(a+b) * (c+d) + (a+b+c) into
(i) Quadruple
(ii) Triple
(iii) Indirect Triple

(b) Draw the flow graph for the following code:
(i) Location = -1
(ii) i = 0
(iii) i < 100 goto 5
(iv) goto 13
(v) t1 = 4i
(vi) t2 = A[t1]
(vii) if t2 = x goto 9
(viii) goto 10

(ix) location = i
(x) t3 = i +1
(xi) i = t3
(xii) goto 3
(xiii) .....

(2 + 2 + 2) + 6 = 12

7. (a) Assuming three registers available generate machine code for the instruction
X = (a/(-(b*c))-d

(b) Construct the DAG for the following basic block:
d := b * c
e := a + b
b := b * c
a := e - d

(c) What is an activation record? Explain clearly the components of activation record.

4 + 4 + 4 = 12

Group – E

8. (a) What are the issues taken into account in the design of a code generator? Discuss in brief.

(b) Translate the following code into machine code and show the register and address descriptors while the instructions are generated. Assume that three registers are available.
t = a – b
u = a – c
v = t + u
a = d
d = v + u

4 + 8 =12

9. Write short notes on any three of the following: **(4 × 3) = 12**
(i) Shift-reduce parser
(ii) LEX and YACC
(iii) Loop Optimization
(iv) L-attributed definitions
(v) Non-LL(1) Grammar.