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IT'S HARD TO BEAT A PERSON
WHO NEVER GIVES UP.
Babe Ruth, American professional baseball player

B.E. (Computer Science & Engineering) Seventh Semester (C.B.S.)

Language Processor

P. Pages : 4 **NRJ/KW/17/4627**

Time : Three Hours Max. Marks : 80

Notes :
1. All questions carry marks as indicated.
2. Solve Question 1 OR Questions No. 2.
3. Solve Question 3 OR Questions No. 4.
4. Solve Question 5 OR Questions No. 6.
5. Solve Question 7 OR Questions No. 8.
6. Solve Question 9 OR Questions No. 10.
7. Solve Question 11 OR Questions No. 12.

1. a) Explain various phases of compiler in brief. For the given expression, **8**

$a = b * c + d/e$

give output of each phase of compiler including symbol table and memory representation.

b) Explain role of Regular Expressions and Finite Automata in Lexical Analyzer. Construct Finite Automata to identify <u>REAL</u> numbers. **5**

OR

2. a) Write a short note on. **5**

i) Cross compiler.

ii) Bootstrapping.

Also, provide suitable example.

b) Construct optimized DFA for the regular expression $(0+1)^{*}011$. Also mention algorithm for minimizing number of states of DFA. **8**

3. a) Design LL(1) parser for the given grammar. **8**

$S \rightarrow UVW$

$U \rightarrow (S) \mid aSb \mid d$

$V \rightarrow a\ V \mid \in$

$W \rightarrow cW \mid \in$

Also, give parsing Actions for the input string "(dc)ac".

b) Construct LR (0)Parser for the following grammar. **6**

$S \rightarrow cA \mid ccB$

$A \rightarrow cA \mid a$

$B \rightarrow ccB \mid b$

check validity of string "ccccb".

OR

4. a) Determine whether given grammar is ambiguous or not. **4**

$S \rightarrow iSeS \mid is \mid a$

If yes, remove ambiguity and rewrite.

b) Determine whether given grammar is LR(1) or not. **10**

$S \rightarrow a\,I\,J\,h$

$I \rightarrow I\,b\,S\,e \mid c$

$J \rightarrow K\,L\,K\,r \mid \in$

$K \rightarrow d \mid \in$

$L \rightarrow p \mid \in$

5. a) List out various ways to represent Three Address code. **6**

Write the given expression in the form of 3-Addr. Code and also represent the same with Listed representation methods.

$a = b * -c + b * -c$

b) Generate 3-Address code for the given program Fragment. **7**

```
While (A > B or C < D) do
        if (D > 20 and not(B < C)) then
         A = A + B
        else
         D = D − 1
         X = Y + Z
```

Write the translation scheme for 'WHILE' Loop.

OR

6. a) Draw Annotated Parse Tree For the given expression and also generate 3-Address code. **5**

$(P < Q \text{ AND } R < S) \text{ OR } \text{NOT}(T < U \text{ AND } R < Q)$

b) For the following array reference, construct three address code (TAC). **8**

$C[i, j, k] = a[b[i, j], k] + a[i, j]$

Dimensions : $c = 10 \times 20 \times 30$

$a, b = 10 \times 20$

Assume , bpw = 4.

7. a) Explain various data structures required for implementation of symbol Table. **6**

b) Explain different error recovery techniques for predictive parsing with suitable example. **7**

OR

8. a) Explain the activation record structure in detail by considering suitable example. **6**

b) Implement phrase Level error recovery routines For LR Parsing by considering given grammar. **7**

$E \to E+E \mid E*E \mid (E) \mid id$

9. a) For the code below apply following code transformations: Constant Folding, constant Propagation, copy propagation, dead-code elimination and strength reduction. **6**

$t_1 = t_1 + t_1$

$L_0:$ $t_2 = 0$

$t_3 = t_1 * 8 + 1$

$t_4 = t_3 + t_2$

$t_5 = t_4 * 4$

$t_6 = t_3 + t_4$

$t_8 = t_6$

if $(t_8 > 0)$ goto L_1

$L_1:$ goto L_0

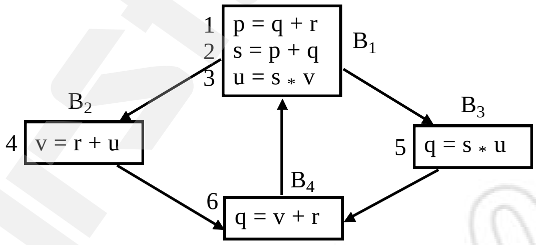
$L_2:$ $t_1 = 1$

$t_9 = 16$

$t_{10} = t_1 * 2$

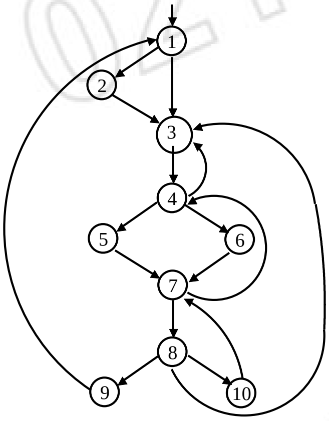
goto L_1

b) Perform Live variable computation for the given flow graph. **8**



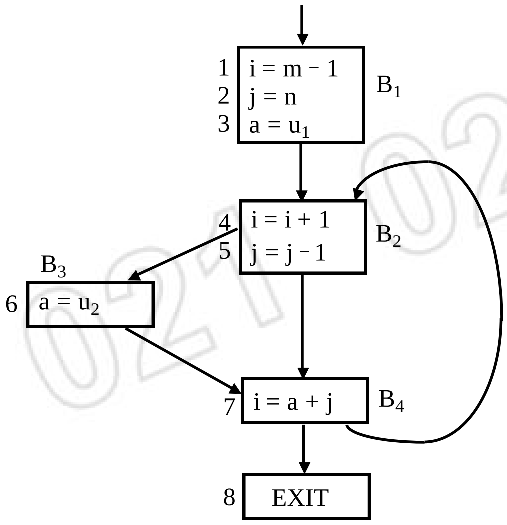
OR

10. a) Construct Dominator set and Dominator tree for the given flow graph. **6**



Also, identify back-edges and Loop for the flow graph.

b) Compute reaching Definitions for the given flow graph. **8**



11. a) Implement simple code generation algorithm for the given 3-Addr. code. **6**

$t = a - b$

$u = a - c$

$v = t + u$

$d = v + u$

Also, Find out total number of registers required for executing the code.

b) Construct DAG for the given expression. Explain the need of Heuristic code generation algorithm and also perform the same on constructed DAG. **7**

$X = (a + b) - (e - (c + d))$

OR

12. a) List out various issues to be considered for code generation phase. Explain each in brief. **6**

b) Generate Target code for the given expression by considering optimal code generation algorithm. **7**

$((a + b) * (c + d)) / (e - f)$.

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The secret of getting ahead is getting started.

~ Mark Twain