B.E. (Computer Technology) Seventh Semester (C.B.S.)

Compilers

P. Pages : 3 **NIR/KW/18/3561**

Time : Three Hours *1855* 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.
8. Due credit will be given to neatness and adequate dimensions.
9. Assume suitable data whenever necessary.
10. Illustrate your answers whenever necessary with the help of neat sketches.

1. a) Explain phases of Compiler in detail. **7**

b) Explain the following with appropriate example : **6**

i) Boot strapping ii) Cross compiler

OR

2. a) Write a LEX program to identify keywords, identifiers and operators. **5**

b) Write recursive descent parsing procedures for the given grammar. **5**

$S \rightarrow aAb$

$A \rightarrow Ac / d$

c) Explain the role of finite automata and regular expression in Lexical Analyzer. **3**

3. a) Is the given grammar LR (0)? **6**

$S \rightarrow cA / ccB$

$A \rightarrow cA / a$

$B \rightarrow ccB / b$

b) Construct LL (1) parsing table for the following grammar. **8**

$E \rightarrow E + T / T$

$T \rightarrow T * F / F$

$F \rightarrow (E) / id$

Show the moves made by this parser on input string id + id * id.

OR

4. a) Construct LALR parsing table for the following grammar. **8**

$S \rightarrow AA$

$A \rightarrow aA / d$

b) Explain the various conflicts occure in LR(0), LR(1) and LALR parsers. **6**

5. a) Explain synthesized and inherited attributes with the example. **6**

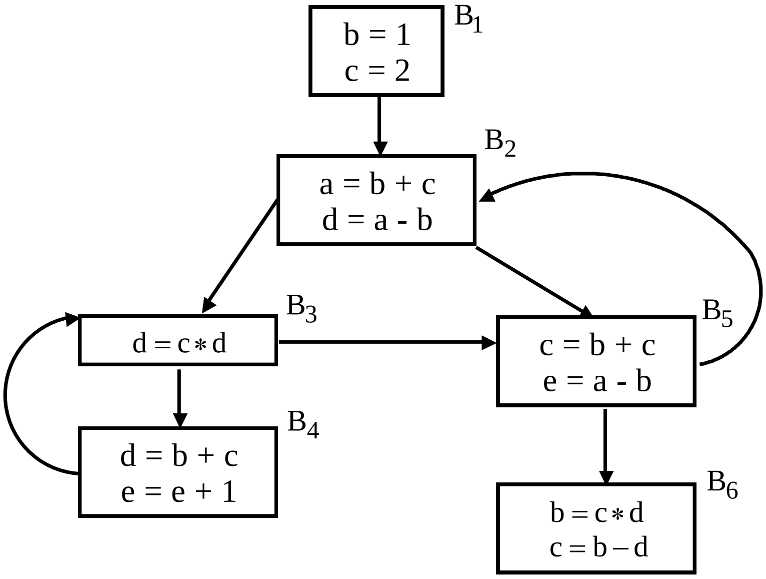
b) What is TAC? Represent the following expression into quadruples, triples and indirect triples. **7**

$$z = -(a+b) + d + (d * (a+b)) + ((a-b) * r)$$

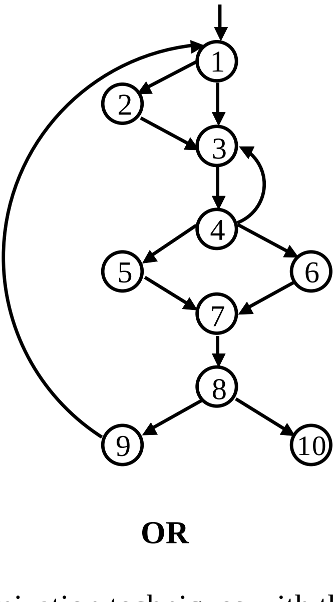
OR

6. Give SDTS and intermediate code for the following statement $A[I, J] = B[I, J] + C[A[K, L]] + D[I + J]$ where A, B, C and D are the arrays of size 2×3, 4×5, 6 and 7 respectively. Assume bpw = 4. Also draw the parse tree. **13**

7. a) Compute IN and OUT for the following flow graph. **10**



b) Give Dominator set and Dominator tree for the following program flow graph. **4**



OR

8. a) Explain the following code optimization techniques with the proper example. **6**

i) Constant Propagation

ii) Dead code elimination

iii) Loop unrolling.

b) What is basic block? How basic blocks can be created? Distribute the following code into several basic blocks. **8**

```
i = 0;
sum = 0;
while (i < 10)
{
      sum = sum + 10;
      i = i + 1;
}
printf (sum);
```

9. a) State and explain the three main difficulties that we face when attempting to generate efficient object code. **5**

b) Generate object code for the following sequence of three address code statements using gencode algorithm. **8**

$T_1 = A + B$

$T_2 = C + D$

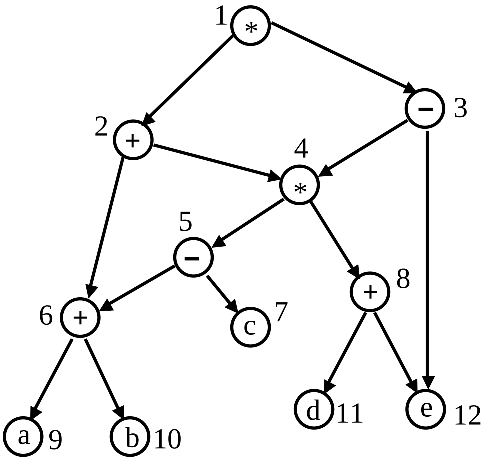
$T_3 = E - T_2$

$T_4 = T_1 - T_3$

OR

10. a) Explain peephole optimization in detail. **6**

b) Give heuristic ordering algorithm and apply it on the following directed acyclic graph to get the optimal order of execution. **7**



11. a) Explain phrase level error recovery in LR parser. **7**

b) Explain symbol table management in block structured languages. **6**

OR

12. a) Explain the various data structures used for the implementation of symbol table. **8**

b) What properties a good error diagnostic mechanism should possess? **5**

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