**COMPILER DESIGN**

**QUESTION BANK**

**MID-3**

**ONE MARK QUESTIONS**

1. What is a flow graph?

   Ans :- A graphical representation of three address cod is called flow graph. Flow graph shows relation between basic blocks and its preceding and sucessors blocks.

2. What is Basic block?

   Ans :-A basic block is a set of consecutive statements that are executed sequentially.

3. Define constant folding.

   Ans:-The process of replacing compiler evaluated expression result inplace of particular variable at runtime is called constant folding.

   Ex:-#define a 50.

   Void main() void main()

   { int i=10; {int i=10:

   I=i+a; i=i+50:

   I=i*a: i=i*50:

   } }

4. What are machine idioms?

   Ans:-The target machine may have hardware instruction to implement certain specific operations effectively.

   For ex:-a=a+1: can be implemented as INC a:

5. What are the basic goals of code movement?

   Ans : To reduce the size of code ie to obtain space complexity.

   To reduce the frequency of execution of code i.e. to obtain the time complexity.

6. What are the advantages of code optimization?

   Ans:-Reduces execution time and memory utilization.

7. What are the two types of analysis performed for global optimization?

Ans:- control flow analysis and Data flow graph

8. Explain Common subexpression elimination?

Ans:- occurrence of an expression 'E' is called common sub expression if E was previously computed and the value of variable in E have not changed since previous computation write example.

9. What is Strength reduction?

Ans : Reduction in strength replaces expensive operations by equivalent cheaper ones on the target machine.

For example:

x2 is invariably cheaper to implement as x * x than as a call to an exponentiation routine.

Fixed-point multiplication or division by a power of two is cheaper to implement as a shift.

Floating-point division by a constant can be implemented as multiplication by a constant.

10. What is Dead code elimination?

Ans:-In applications some block of code may not be executed at any time such block of code us called dead code (or) unreachable code. Write example also

11. What are the data flow properties?

Ans:-point , Reference point , Evaluation point ,Definition point ,path, Reaching definition, available expression, live variable, very busy expression.

12. What is available expression?

Ans : An expression E is available at program point p if E is computed on every path to p and the value of E has not changed since the last time E was computed on path to p. Write example also.from notes

13What is reaching definition?

Ans: we say a definition d reaches a point p if there is a immediate path from d to p such that d is not killed along the path write example also from notes

14.What is live variable?

Ans : A variable V is live at program point p if p will be used on some execution path originating from p before V is overridden. Write example from notes.

15.Mention the applications of DAGs.

Ans : Application of DAGs:

1. We can automatically detect common sub expressions.

2. We can determine which identifiers have their values used in the block.

3. We can determine which statements compute values that could be used outside the block.

16. Define reloadable object module.

Ans : It allows sub programs to be compiled separately.

17. What is register descriptor?

Ans : A register descriptor is used to keep track of what is currently in each registers. The register descriptors show that initially all the registers are empty.

18 What is address descriptor?

Ans : An address descriptor stores the location where the current value of the name can be found at run time.

19 What are the various forms of target programs?

Ans : Absolute machine language

It can be placed in a fixed memory location and can be executed immediately.

b. Relocatable machine language

It allows subprograms to be compiled separately.

c. Assembly language

symbolic instructions and macro functions.

20. How would you calculate the cost of an instruction?

Ans : Instruction cost = 1+cost for source and destination address modes. This cost corresponds to the length of the instruction.

Address modes involving registers have cost zero.

Address modes involving memory location or literal have cost one.

21. Define Live and dead variables?

Ans : the name in the basic block is said to be live at a given point if its value is used after that point in the program. And the name in the basic block is said to be dead at a given point if its value is never used after that point in the program.

22. Consider the following code sequence

```
MOV B, R0
ADD C, R0
MOV R0,A
```

Calculate the cost of above instructions.

Ans : MOV B, R0. cost =1+1+0=2

ADD C, R0. cost =1+1+0=2

MOV R0,A cost =1+1+0=2

Total cost =2+2+2. =6

23. What is the cost of the following set of instructions

```
mov *R1, * R0      add *R2,*R0
```

Ans : mov *R1, * R0 cost =1+0+0 =1

add *R2,*R0. cost =1+0+0 =1

Total cost = 1+1. =2

24. Generate a code for following statements

```
a = b + c ;      d = a + e ;
```

Ans : The three address code for given statements is

```
t1=a;
t2=t1+c;
a=t2;
t3=t2+e;
d=t3;
```

25. Consider the following code sequence

```
MOV B, A
```

ADD C, A

Calculate the cost of above instructions.

Ans : MOV B, A. cost =1+1+1=3

ADD C, A. cost =1+1+1=3

Total cost =3+3. =6

26. What are the characteristics of peephole optimization?

Ans : The characteristics of peephole optimization:

1) Redundant-instruction elimination
2) Flow-of-control optimizations
3) Algebraic simplifications
4) Use of machine idioms.

27. What are the advantages of NEXT-USE information?

Ans : If the name in a register is no longer needed, then we remove the name from the register and the register can be used to store some other names.

28. Write down the issues in the code generation phase?

Ans : The following issues arise during the code generation phase:

1) Input to code generator
2) Target program
3) Memory management
4) Instruction selectio
5) Register allocation
6) Evaluation order

29. Why we follow Backword approach in next-use information calculation?

Ans : only in backward approach we can know the next use of a particular variable

30. List the types of addressing modes?

Ans : absolute addressing mode, Register addressing mode, Indexed addressing mode, indirect addressing mode, indirect indexed addressing mode, literal addressing mode.

**FIVE MARK QUESTIONS**

1. Explain about the principal Sources of optimization?
2. Explain about loops in flow graphs?
3. Generate the flow graph for the following expression?

$S \rightarrow id = E$ $S \rightarrow S;S$ $S \rightarrow$ if E then S else S

$S \rightarrow$ do S while E $E \rightarrow id + id$ $E \rightarrow id$

4 . Explain Data Flow equation with an example?

5. Explain about Machine dependant optimization techniques?

6. What is code generator? Explain design issues of code generator.

7. Explain about peephole optimization.

8. Explain the simple code generator with a suitable example.

9. What is use of Next-Use information? Explain how to calculate next-use information with an example?

10. Compute the DAG for the following three address statements. Considering this DAG as an example, explain the process of code generation from DAG.

t1 = a + b t2 = c + d t3 = e – t2 t4 = t1 - t3