Name : .....

Roll No. : .....

Invigilator's Signature : .....

CS/M.TECH (IT-SE)/SEM-3/MSE-303A/2011-12

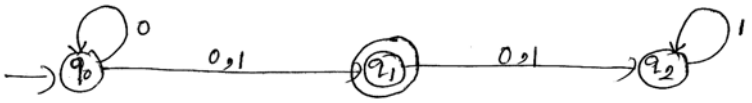
2011
COMPILER DESIGN

Time Allotted : 3 Hours *Full Marks* : 70

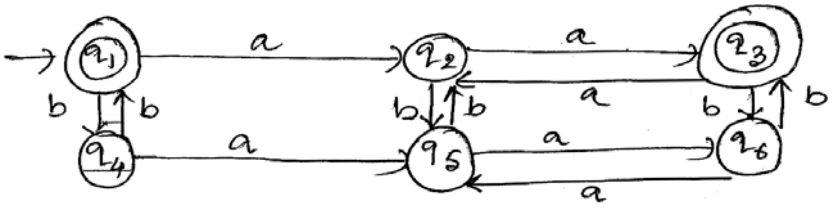
The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

Answer any *five* questions.

1. Answer the following questions :
   a) Explain the different phases of a compiler, showing the output of each phase, using the example of the following statement :
      Position : = Initial + rate * 60. 9
   b) Differentiate between compiler and interpreter. 2
   c) What is the relation between lexemes and tokens ? 2
   d) What do you mean by syntax tree ? 1
2. a) Consider the following context free grammar :
      $S \rightarrow SS + | SS * | a$
      Show how the string aa+a* can be generated by this grammar. 3
   b) Construct a parse tree for the above string. 2
   c) Construct the NFA of the following NDFA : 4



d) Minimize the following automata M : 5



3. a) Consider the grammar :

$S \rightarrow ACB \mid CbB \mid Ba$

$A \rightarrow da \mid BC$

$B \rightarrow g \mid \in$

$C \rightarrow h \mid \in$

Find out the FIRST (S), FIRST (A), FIRST (B), FIRST (C). 4

b) Consider the grammar :

$S \rightarrow aABb$

$A \rightarrow c \mid \in$

$B \rightarrow d \mid \in$

Find out the FOLLOW (A) and FOLLOW (B). 2 + 2

c) Draw the parse table. 2

d) Whether string acdb is accepted or not ? 4

4. a) What are the conditions a grammar to be LL (1) ? 2

b) Test whether the grammar is LL (1) or not, and construct a predictive parsing table. 2 + 4

$S \rightarrow AaAb \mid BbBa$

$A \rightarrow \in$

$B \rightarrow \in$

c) What is Handle ? 1

d) Consider the following grammar, and show the handle of each right sentential form for the string (a, (a, a)).

$S \rightarrow (L) \mid a$

$L \rightarrow L, S \mid S.$ 2

e) Explain Shift Reduce parsing technique. 3

5. a) Explain LR parsing algorithm. 5

b) Consider the following grammar :

$E \rightarrow E + E \mid E * E \mid id.$

Find the handles of the right sentential forms of reduction of the string id + id * id. 3

c) Construct an SLR (1) parsing table for the following grammar : 6

$S \rightarrow xAy \mid xBy \mid xA2$

$A \rightarrow aS \mid q$

$B \rightarrow q$

6. a) Translate the following expression

x = (a + b) * (c + d) + (a + b + c)

into i) quadruples

ii) triples

iii) indirect triples. 6

b) Generate the machine code for the following instructions : 4

v = a + (b * c) – d

c) Explain the peephole optimization technique. 4

7. a) Construct the DAG for the following basic block : 5

d : = b * c

e : = a + b

b : = b * c

a : = e – d

b) What do you mean by three address code ? 2

c) Generate the three address code for the following code : 4

```
While (A < C and B > D) do
if A = 1 then C = C + 1
else
    while A < = D do
     A = A + 3
```

d) Explain Nesting Depth Approach with suitable example. 3

8. a) What is symbol table ? Explain its different organizations. 1 + 4

b) What do you mean by activation record of a procedure ? Explain its different contents. 5

c) What is LEX ? 2

d) What is YACC ? 2