

Computer Science : Paper II - Design & Implementation of Modern Compilers.

Time: 2 1/2 Hours

Marks: 60

N.B.

- 1) All questions are compulsory.
- 2) Figures to the right indicate marks.
- 3) Illustration, depth answers and diagrams will be appreciated.
- 4) Mixing of sub-questions is not allowed.
- 5) Each question carries 5 marks.

Q.1

Attempt **Any Two** of the following:

12 Marks

- a) What is minimization of DFA? Give an example to explain the step by step minimization of DFA.
- b) What is shift reduction parsing? Parse the input `id-num*id$` using shift reduce parsing method for the following grammar.
 $S \rightarrow E\$$
 $E \rightarrow E+T \mid E-T \mid T$
 $T \rightarrow T * F \mid T / F \mid F$
 $F \rightarrow \text{num} \mid \text{id}$
- c) What are regular expressions? Write the regular expression for constructing identifiers used for C language consisting of characters and digits. Draw the transition diagram for the same
- d) List and explain different phases of the compiler.

Q.2

Attempt **Any Two** of the following:

12 Marks

- a) Write a note on types of LR parsers.
- b) What are ambiguous grammars? Explain the concept of ambiguous grammar with the help of suitable example.
- c) Consider the following production rules:
 $S \rightarrow S \text{ or } A$
 $S \rightarrow A$
 $A \rightarrow A \text{ and } B$
 $A \rightarrow B$
 $B \rightarrow x$
 $B \rightarrow y$
Compute LR (0) item sets.
- d) Check whether the following grammar is in SLR or not.
 $S \rightarrow PP$
 $P \rightarrow pP$
 $P \rightarrow e$

Q.3 Attempt **Any Two** of the following: **12 Marks**

- a) What are activation records with respect to the tiger compiler? Explain in brief.
- b) What is an intermediate code? Why are they important? Give an example.
- c) Translate the following expressions into Quadruples, Triples and three-address code.
 - a) $(a+b)*(c+d)+(a+b+c)$
 - b) $a+(b*c)/(-b*-c+d)$
- d) What is the need of stack and discuss the concept of stack frame in tiger compiler.

Q.4 Attempt **Any Two** of the following: **12 Marks**

- a) What is DAG? Draw the DAG and syntax representations of the expression: $y=x*3+x*3$
- b) Write a note on various optimizing transformations used by the compiler.
- c) What is a data flow analysis? State different types of data flow analysis problems.
- d) What is dead code elimination? Give an example.

Q.5 Attempt **Any Two** of the following: **12 Marks**

- a) What is binding? What are its types? Explain the bindings for the Tiger compiler.
- b) State the drawbacks of top down parsing with backtracking by giving a suitable example.
- c) Develop a Predictive Parsing Table for the following grammar and Parse the string "ababbbb".
 - $S \rightarrow AB$
 - $A \rightarrow aAB$
 - $B \rightarrow bA$
 - $A \rightarrow \epsilon$
 - $S \rightarrow \epsilon$
- d) Write a note on
 - i. Reducible flow graphs
 - ii. Reduction
