

MCA
(SEM III) THEORY EXAMINATION 2022-23
COMPILER DESIGN

Time: 3 Hours**Total Marks: 100**

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. Attempt all questions in brief. 2x10 = 20

- (a) Discuss the need of cross compiler and how it can be achieved?
- (b) Describe the Arden's theorem
- (c) Investigate the use of pass of a compiler.
- (d) Discuss the requirement of a "lookahead" feature in order to specify their lexical Analyzers.
- (e) Demonstrate an example of parse tree and syntax tree.
- (f) Show the actions available with shift reduce parsers
- (g) Define a postfix notation.
- (h) Explain peephole optimization.
- (i) Define DAG.
- (j) What do you mean by machine dependent and machine independent optimization?

SECTION B

2. Attempt any three of the following: 10x3 = 30

- (a) Describe the symbol table manager and error handler routines?
- (b) Examine the output of lexical analyzer for the following program.

```
int max (x, y)
int x, y;

/* this program find out the maximum of two numbers*/
{
    return (x > y? x: y);
}
```

- (c) What are the difficulties with top-down parsing? Explain with examples.
- (d) What are the various ways of calling the procedure? Explain in detail
- (e) Discuss about the following:
 - (i) Copy Propagation
 - (ii) Dead-code Elimination

SECTION C

3. Attempt any *one* part of the following: 10x1 = 10
- (a) Consider the following grammar
- $$\begin{aligned} E &\rightarrow E + E \\ E &\rightarrow E * E \\ E &\rightarrow (E) \\ E &\rightarrow id \end{aligned}$$
- Discover whether the above grammar is unambiguous or not. If not convert it and also remove the left recursion from the grammar.
- (b) For the Regular expression $(a/b)^*a(a/b)$. Draw the NFA. Obtain DFA form NFA
4. Attempt any *one* part of the following: 10x1 = 10
- (a) Point out the various phases of compiler and write down the output of each phase of the compilation for the expression $a: = (b + d) + (c * 5)$.
- (b) Illustrate how a lexical analyzer can be implemented and Write a LEX program to identify octal and hexadecimal numbers and implement specific action after identifying these tokens.
5. Attempt any *one* part of the following: 10x1 = 10
- (a) Compute FIRST and FOLLOW for given Grammar
- $$\begin{aligned} S &\rightarrow aBDh \\ B &\rightarrow cC \\ C &\rightarrow bC \mid \epsilon \\ D &\rightarrow EF \\ E &\rightarrow g \mid \epsilon \\ F &\rightarrow f \mid \epsilon \end{aligned}$$
- (b) Make use of the recursive descent parser to write the code in C-Language for the following grammar
- $$\begin{aligned} E &\rightarrow TE' \\ E' &\rightarrow + TE' \mid \epsilon \\ T &\rightarrow FT' \\ T' &\rightarrow * FT' \mid \epsilon \\ F &\rightarrow (E) \mid id \end{aligned}$$
6. Attempt any *one* part of the following: 10x1 = 10
- (a) Break down the 3-address code for the statements $a = c * -d + b * -c$?
- (b) classify three types of implementations of three-address statements
7. Attempt any *one* part of the following: 10x1 = 10
- (a) What are the issues in the design of code generator? Explain in detail
- (b) What is an activation record? Draw diagram of General Activation record and explain the purpose of different fields of an activation record.