Mode of Examination: Online

M.Sc. (Computer Science) Semester-IV Examination, 2020

2020

Subject: Computer Science

Paper: CSM401-Elective-I (Compiler Design)

Full Marks: 70

Time: 3:30 Hours

Date: 01.10.2020 **Duration: 12:00 Noon – 3:30 PM**

The figures in the margin indicate full marks

Candidates are required to answer in their own words as far as applicable

Each Page of answer scripts should have your examination Roll Number.

The name of the scanned copy of answer script should be of the following format:

CSM401-Compiler-Design-Examination-Roll-Number.pdf

(Example: CSM401-Compiler-Design-C91/CSC/181001.pdf

The subject of the mail should be answer-script file name

The scanned copy of the answer script is to be sent to cumsc042020@gmail.com

No answer script will be valid if received after 3:30 PM on Examination Date

Write the answers with black ink ball pen

Answer Question number 1, 2, and any Four from the rest.

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1. Answer any 5 (five) questions from the following: [5x2=10]

i. Describe the type of the grammar with a set of production rules $P = \{S \rightarrow a \mid b \mid Sa \mid bS\}$.

ii. State the difference between Context-Free Grammar and Regular Grammar in the context of the compilation process.

iii. Explain with a suitable example for the use of the inherited attribute.

iv. What do you understand by operator precedence parser?

v. What do you understand by the Handle of a string?

vi. What is the role of Symbol Table in compiler construction?

vii. What is left factoring?

2. Answer any 5 (five) questions (Briefly give reasons for your answer): [5x4=20]

i. Write a short note on the recursive descendent parser.

ii. Compute the set of non-terminals which produce the empty string in the following grammar:

a. $S \rightarrow AB$

b. $A \rightarrow CC \mid a$

c. $B \rightarrow DD \mid \epsilon$

d. $C \rightarrow c$

e. $D \rightarrow AAE \mid b \mid \epsilon$

f. $E \rightarrow SS$

iii. Write a short note for errors handling during lexical analysis and parsing.

iv. Remove the left factoring from the following production rules

A→abB|abC

B→b

C→c

v. Discuss the problems with Top-down Parsing?

vi. Explain the issues related to the design of the code generator.

vii. Explain the error recovery strategies for different parsing techniques.

3. a. State the difficulties in the parsing process when we use left-recursive non-terminals in the underlying grammar.
   b. Mention the rules that we use to eliminate left-recursions (both direct and indirect) from a grammar.
   c. Apply these rules for the following grammar:

$E \rightarrow E + T \mid T$
$T \rightarrow T * F \mid F$
$F \rightarrow (E) \mid a$

[2+3+5]

4. a. What do you mean by instruction cost - explain with a suitable example.
   b. State the importance of code-optimization.
   c. Define basic block.
   d. What are the different transformations generally applied for the Basic Block during code-optimization - explain with a suitable example?

[2+2+2+4]

5. a. Explain First and Follow
   b. Calculate First and Follow of the following production rules:

S→ABCDE
A→a|ϵ
B→b|ϵ
C→c
D→d|ϵ
E→e|ϵ

[4+6]

6. a. What is a viable prefix?
   b. What are the specifications of a simple type checker?
   c. What are activation trees?
   d. Write the role of activation trees in context of type checking.
   e. What is an activation record?

[2+2+2+2+2]

7. a. State the function of LEX and YAAC software packages.

b. Explain how call by address is different from the call by reference in the context of parameter passing.
c. State the difference between synthesized attributes and inherited attributes.

[4+3+3]

8. a. What is copy propagation? Explain with an example that copy propagation may produce dead code.

b. Briefly explain the construction of syntax trees with a suitable example.

[(2+4)+4]