ST. XAVIER'S COLLEGE
KOLKATA
(AUTONOMOUS)

3rd SEMESTER EXAMINATION
DECEMBER 2021
M. Sc. COMPUTER SCIENCE

CMSM4321

COMPILER DESIGN

Tuesday, December 07, 2021
12:00 NOON to 3:00 PM
3 hours
Full Marks : **80**

PLEASE READ THESE INSTRUCTIONS BEFORE YOU START WRITING:

1. Of the questions attempted, the answers to only the first required number of questions (as stipulated in the question paper) will be evaluated. **So please do not attempt extra questions**.
2. Use fountain pen or ball-point pen of **blue** or **black ink**.
3. Write **(not type)** the answers legibly, in your own words as far as practicable, on A4 size sheets.
4. Save the pages of your answer sheets (hand-written document) to a single PDF file and name the document accurately i.e. **Roll No_Paper Code.PDF** (example: 147_PH36141T).
5. Send the PDF file to the following email address **(in REPLY mode) within 30 minutes of the completion of the examination**: **CMSM43212122@SXCCAL.EDU**
6. The scanned answer scripts should have **enough clarity** to enable evaluation.
7. On top of each page **handwrite** the following information: **Name, Roll Number, Paper Code , Date,** and **Page Number**
8. No multiple submissions would be allowed.

The marks are given in **brackets [ ]** at the end of each question or part question.

The question paper consists of **2** pages.

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So, PLEASE DO NOT ATTEMPT EXTRA QUESTIONS.

GROUP A

Answer **QUESTION 1** and **ANY TWO** from the rest**.**

1. Answer **ANY TWO** of the following questions:
   (a) Explain the role of the Table Management routine in a compiler. **[5]**
   (b) What are the functions of the Lexical Analyser? **[5]**
   (c) Illustrate how three address code can be represented using indirect triples. **[5]**

2. (a) Explain the process of handle pruning in Operator Precedence Parsing using an appropriate example.
   (b) What are the limitations of Operator Precedence Parsing? **[10+5]**

3. (a) With the help of an appropriate grammar explain the process of constructing the Predictive Parsing Table and using the same to parse an input string.
   (b) "A Predictive Parser can be used for all grammars". Justify or contradict. **[12+3]**

4. (a) Give suitable examples to show how the Error Handler Routine may be invoked by a Shift-Reduce Parser.
   (b) Describe any two loop optimisation techniques using appropriate examples.
   (c) Write a short note on Syntax Directed Translation Scheme. **[5+5+5]**

GROUP B

Answer **QUESTION 5** and **ANY TWO** from the rest.

5. Answer **ANY TWO** of the following questions:
   (a) What do you mean by Regular Grammar and Regular Language? Give suitable example. **[5]**
   (b) What is a Hybrid Compiler? Explain with suitable example. **[5]**
   (c) Describe function of a Symbol Table. **[5]**

6. (a) Write all compilation steps to compile the expression:
   $y=a*x^2 + b*x + c$
   Finally generate the target code in assembly language.
   (b) Describe function of LEX for C-type language. **[7.5+7.5]**

7. (a) Convert the following Regular expression to Deterministic Finite State Automation:
   (00+11)*(0+1)*(00+11)*
   (b) Construct a Context Free Grammar (CFG) 'G' generating all integers (with sign). **[7.5+7.5]**

8. (a) Write C-type function void binary_search(int a[10], int n, int num) to search a number, 'num' in an array, a[] using Binary Search algorithm. Convert the whole function into 3-address instructions. Identify all the leaders in 3-address instructions. Draw Block diagram and also the flow graph of all 3-address instructions. Find how many loops are there in the flow graph
   (b) Draw Directed Acyclic Graph (DAG) of the following expression:
   Y=-a+(a+a+(a+a+(a+a+(a+a+a+a)))).
   Use mkleaf(), mknode() function. **[7.5+7.5]**

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