LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **COMPUTER SCIENCE**

THIRD SEMESTER – **APRIL 2023**

PCS 3301 – THEORY OF COMPUTATION AND COMPILER DESIGN

Date: 09-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

PART - A

Answer ALL the questions **(10 × 2 = 20 marks)**

1. Define a finite set. Give an example.
2. List out any four types of function.
3. Give brief notes on a finite state automaton.
4. Design a DFA that accepts all positive even integers.
5. Write a short note on Turing machine.
6. Why do we need a compiler?
7. What is the role of lexical analyzer?
8. What is tokenization?
9. What is frequency reduction?
10. What do you mean by peephole optimization?

PART – B

Answer ALL the questions **(5x8=40 Marks)**

11. a) Write the grammar to generate the set of all strings on {a,b} that ends with "aa". Simulate any two strings.

(Or)

b) State and prove two De Morgan's laws in sets.

12. a) Construct a DFA on {0, 1} that accepts all even strings of length greater than or equal to 10. Simulate a string.

(Or)

b) Design a finite state automaton on {a, b, c} to produce all strings that does not end with 'a'. Simulate a string.

13. a) Give an account on universal Turing machine.

(Or)

b) Translate the assignment statement "Amount = initial + rate * 90" on the different phases of a compiler.

14. a) Explain top-down parsing with example.

(Or)

b) Consider the following grammar

$S \rightarrow aB / bA$

$S \rightarrow aS / bAA / a$

$B \rightarrow bS / aBB / b$

Derive the leftmost derivation and draw the parse tree for the string aaabbabba.

15. a). Explain the basic blocks with example.

(Or)

b). Discuss the flow graph with example.

PART - C

Answer ANY TWO questions **(2 × 20 = 40 marks)**

16. a) Elaborately explain the classification of languages and grammar proposed by Noam Chomsky.

b) Construct a DFA on {a, b} that accepts all strings of length 12 and not starting with 'ab'.

(12+8)

17. a) Convert the given NDFA $(Q, \sum, q_0, F, \delta)$ to a FSA where

$Q = \{q_0, q_1, q_2, q_3\}$

$\sum = \{a, b\}$

$F = \{q_3\}$

q_0 is the initial state

Transition function is defined as follows:

$\boldsymbol{\delta}$	**a**	**B**
$\boldsymbol{q_0}$	q_2, q_3	-
$\boldsymbol{q_1}$	q_2	q_2
$\boldsymbol{q_2}$	-	q_1, q_2
$\boldsymbol{q_3}$	q_3	q_3

b) What is regular Grammar? Write the algorithm to convert the regular expression into NFA. Give example.

(10+10)

18. a) . Explain DAG representation with example.

b). Explain the phases of a compiler with a diagram.

(10+10)

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