



**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**

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

**THIRD SEMESTER – NOVEMBER 2017**

**16PCS3ID01 - THEORY OF COMPUTATION AND COMPILER DESIGN**

Date: 13-11-2017  
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

**Part A**

**Answer ALL questions:**

**(10 x 2 =20)**

1. Define right-linear grammar.
2. Define a terminal. Illustrate with an example.
3. Define a FSA.
4. Construct a finite automaton to produce all positive even numbers.
5. What is a Turing machine?
6. List out the compiler construction tools.
7. Define Context free grammar.
8. What is the role of a lexical Analyzer?
9. Write the application of DAG's.
10. Define Flow graph.

**Part B**

**Answer ALL questions:**

**(5 x 8 = 40)**

11. (a) State and prove De Morgan's laws in sets diagrammatically (2 laws).

Or

- (b) Construct a grammar to produce strings on  $\{0,1\}$  starting with "11".

12. (a) Construct a DFA to produce all non-negative integers that are multiples of 5.

Or

- (b) Determine the FSA corresponding to the following NDFSA:

$M = (K, I, \delta, q_0, F)$ , where  $K = \{q_0, q_1, q_2, q_3\}$ ,  $I = \{a, b\}$   $\bar{a}$   $F = \{q_3\}$  and  $\delta$  defined by

$u$	$a$	$b$
$q_0$	$[q_1]$	$[q_3]$
$q_1$	$[q_2, q_3]$	$[q_3]$
$q_2$	$[q_1, q_3]$	$[ ]$
$q_3$	$[q_1, q_2, q_3]$	$[ ]$

13. (a) State and prove Halting problem.

Or

(b). How the following expression will be converted to machine code while passing through the phases of a compiler?

$$Y = A + 25 * B$$

14. (a) Discuss about the phases of a compiler with a neat sketch.

Or

(b) Write an algorithm to convert a Regular Expression to NFA.

15. (a). Define optimization. Explain with an example the local and loop optimization.

Or

(b) Explain in detail about code optimization with examples.

### Part C

**Answer any TWO questions:**

**(2 x 20 = 40)**

16. (a) Elaborately explain Chomsky classification.

(b) Create a phrase structure grammar to produce strings on the character set  $\{a,b\}$  ending with "aa". Simulate the following strings: (i) "ababbaa" (ii) "bbbbaa".

17. (a) Construct a NDFA to produce strings on  $\{0,1\}$  so that "1" is always followed by a "0".

b) What is Left recursion? Construct a predictive parsing table for the following grammar.

$$S \rightarrow A B C D E, A \rightarrow a / \quad, B \rightarrow b / \quad, C \rightarrow c, D \rightarrow d / \quad, E \rightarrow e /$$

18. (a) Write a procedure to construct a DAG. Explain with an example.

(b) Write a procedure to do the shift reduce parsing technique. Find the Shift Reduce parser for the grammar  $S \rightarrow C C, C \rightarrow c C / d$  for the input string "c d d".

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