

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY
MCA - SEMESTER– II • EXAMINATION – WINTER 2015

Subject Code: 620007

Date: 09/12/2015

Subject Name: Theory of Computation

Time: 02.30 pm to 05.00 pm

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Write De Morgan laws & prove it using truth table. **07**
(b) Let $A = \{10, 15\}$ and $B = \{10, 20\}$. Find $P(A)$, $P(B)$, $P(A-B)$. **07**
- Q.2** (a) Write regular expression for the following: **07**
1) Identifier with minimum string length is 1, contains only letter, underscore and digits. It must begin with letter or underscore.
2) String ending in 1 and not containing 00.
(b) Verify that! Given statement is a tautology: $p \vee q \vee r \vee s$ **07**
OR
(b) Let $P(n)$ be the statement, $1 + 2 + \dots + n = [n(n+1)/2]$. To show that $P(n)$ is true for every $n \geq 0$, using mathematical induction principle. **07**
- Q.3** (a) Define Finite Automata. Explain all terms involved in definition. Write one suitable example of Finite Automaton. **07**
(b) Draw transition diagram and transition table to recognize $\{0, 1\}^* \{10\}$. **07**
OR
- Q.3** (a) Define Nondeterministic Finite Automata. Explain all terms involved in definition. Write one suitable example of Nondeterministic Finite Automaton. **07**
(b) Draw an NFA- Λ that accepting $\{0\} \{1\}^* \cup \{0\}^* \{1\}$. **07**
- Q.4** (a) Define Context-Free Grammar (CFG). Explain all terms involved in definition. Write one suitable example of CFG. **07**
(b) Consider given production rules: **07**
 $S \rightarrow S + S \mid S - S \mid S * S \mid S / S \mid (S) \mid a$
Derive : $(a - a) * (a + a)$
OR
- Q.4** (a) Define Pushdown Automaton (PDA). Explain all terms involved in definition. Write one suitable example of PDA. **07**
(b) Write state transition table Deterministic PDA that accept string with more a's than b's with suitable example. **07**
- Q.5** (a) Explain top-down parsing with suitable example. **07**
(b) Explain bottom-up parsing with suitable example. **07**
OR
- Q.5** (a) Define Turing Machines (TM). Explain all terms involved in definition. Write one suitable example of TM. **07**
(b) Draw state transition diagram, a TM accepts $\{a, b\}^* \{aba\}$ **07**
