

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, APRIL 2018

Course Code: IT303

Course Name: THEORY OF COMPUTATION (IT)

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any two full questions, each carries 15 marks

Marks

- 1 a) Explain Chomsky classification of grammars. (5)
- b) If $\Sigma = \{a, b, c\}$ then write $\Sigma^1, \Sigma^2, \Sigma^3, \Sigma^*$. (4)
- c) Show how an NFA can be created which accepts the reverse of a language. (6)
- 2 a) Design an NFA for $L = \{w | w \text{ has at least 2 consecutive 0's or 1's over } \Sigma = \{0, 1\}\}$. (6)
- b) Define the language of DFA, NFA and NFA- ϵ . (4)
- c) Convert the following NFA to DFA. (5)

δ	0	1
$\rightarrow p$	{p,q}	{p}
q	ϕ	{r}
*r	{p,r}	{q}

- 3 a) Describe the language of the following DFA. (4)

δ	0	1
$\rightarrow A$	B	A
*B	A	B

- b) State and prove the equivalence of NFA and DFA. (6)
- c) Design a Mealy machine to print 2's complement of a binary number. (5)

PART B

Answer any two full questions, each carries 15 marks

- 4 a) Give regular expressions for the following: (2)
 - i) Set of all binary strings beginning with 110.
 - ii) Set of all binary strings, contains exactly three 1's.
- b) Convert the following regular expression to ϵ -NFA and then to NFA. (10)
 - i) $011(0+1)^*(0+1)$
 - ii) $(a+b)(ab)^*$
- c) Define Context Free Grammar and Context Free Language. (3)
- 5 a) Prove that for every regular expression, there exists a deterministic Finite Automata. (8)
- b) Show that the language $L = \{0^n 1^{2n} | n \geq 1\}$ is not regular. (7)
- 6 a) List the applications of PDA and CFL. (4)
- b) Design a PDA for the language $L = \{a^i b^j c^k | i \neq j \text{ or } j \neq k\}$. (8)

- c) Explain ambiguity in CFG with the help of an example. (3)

PART C

Answer any two full questions, each carries 20 marks

- 7 a) Show that the Universal Language is not recursive. (10)
b) Design a Turing Machine for $L = \{ww \mid w \in \{0,1\}^*\}$. (10)
- 8 a) List and explain the variants of Turing Machine, and show that they are equivalent to a single tape Turing Machine. (12)
b) Design a Turing Machine that performs integer addition. (8)
- 9 a) Define Halting Problem and show that it is undecidable. (5)
b) What is Linear Bounded Automata? (5)
c) Build a Turing Machine that accepts the language $L = \{a^n b^{2n}\}$. (10)

