

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FIFTH SEMESTER B.TECH DEGREE EXAMINATION, DECEMBER 2017

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) Define the following (3)
- (i) Language
 - (ii) Finite Automata
 - (iii) Transition diagram
- b) Design a moore machine which count the number of occurrence of substring aab in a given string (7)
- c) Prove that L is accepted by an NFA if and only if L is accepted by DFA (5)
- 2 a) Discuss about Chomsky classification of language (5)
- b) Prove the equivalence of moore and mealy machine (5)
- c) Construct a DFA that accepts all strings on $\{0,1\}$, except those containing the substring 001. (5)
- 3 a) Minimize the following DFA (7)
- | | 0 | 1 |
|----|---|---|
| A | B | C |
| B | D | E |
| C | F | G |
| *D | D | E |
| E | F | G |
| *F | D | E |
| *G | F | G |
- b) Prove that L is accepted by an NFA- ϵ if and only if L is accepted by NFA (5)
- c) Define the following (3)
- (i) Kleene star
 - (ii) Concatenation
 - (iii) Reversal

PART B

Answer any two full questions, each carries 15 marks.

- 4 a) What is a regular expression? Write a regular expression that accept all strings on $\{0,1\}$ such that it accepts at most one pair of consecutive 1's (5)

- b) What is ambiguous CFG ? Show that the grammar (5)

$$E \rightarrow E + E | E * E | (E) | I$$

$$I \rightarrow a | b | c$$
 is ambiguous
- c) Design a PDA to accept $L = \{0^n 1^m 0^n \mid m, n \geq 1\}$ (5)
- 5 a) State pumping lemma for regular languages. Use pumping lemma to show that (8)
 $L = \{a^p \mid p \text{ is a prime}\}$ is not regular
- b) Convert the grammar $S \rightarrow AB, A \rightarrow BS | b, B \rightarrow SA | a$ into GNF (4)
- c) Construct the PDA equivalent to the following grammar (3)

$$S \rightarrow 0BB, B \rightarrow 0S | 1S | 0$$
- 6 a) Use pumping lemma to show that $a^n \mid n \text{ is a perfect cube}$ is not a CFL (5)
- b) Prove that regular expression is closed under homomorphism (5)
- c) Give CFG for the following regular expression $(0+11)^*(011)1^*$ (5)

PART C

Answer any two full questions, each carries 20 marks.

- 7 a) Write note on variants of Turing Machine. Show that multi tape TM is equivalent (9)
to single tape TM.
- b) Design a TM which finds 2's complement of a given number. (8)
- c) Prove that the complement of recursive language is recursive. (3)
- 8 a) What is Linear Bound Automata? (5)
- b) Construct T.M which accepts the language $L = \{a^n b^n c^n \mid n \geq 1\}$ (8)
- c) Prove that the halting problem is undecidable. (7)
- 9 a) Explain post correspondence problem. (5)
- b) Prove that universal language is recursively enumerable. (8)
- c) Construct T.M which reverse a string (7)
