|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Scheme of Valuation/Answer Key**  **(Scheme of evaluation (marks in brackets) and answers of problems/key)**  **APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  FIFTH SEMESTER B.TECH DEGREE EXAMINATION(S), MAY 2019 | | | | | |
| **Course Code: CS301** | | | | | |
| **Course Name: THEORY OF COMPUTATION** | | | | | |
| Max. Marks: 100 | | |  | Duration: 3 Hours | |
| **PART A** | | | | | |
|  |  | ***Answer all questions, each carries3 marks.*** | | | Marks |
| 1 |  | Finite state automata tuple explanation  Model | | | (2)  (1) |
| 2 |  | DFA for the language 101\* | | | (3) |
| 3 |  | regular expression. | | | (3) |
| 4 |  | two-way finite automata explanation | | | (3) |
| **PART B** | | | | | |
| ***Answer any two full questions, each carries9 marks.*** | | | | | |
| 5 | a) | Regular expression corresponding to the language of the given DFA. | | | (4.5) |
|  | b) | Prove the equivalence of NFA and ε-NFA. | | | (4.5) |
| 6 | a) | Convert the ε-NFA to NFA. | | | (4.5) |
|  | b) | Equivalence of regular expression and finite state automata | | | (4.5) |
| 7 | a) | Compare the transition functions of DFA, NFA and ε-NFA. | | | (4.5) |
|  | b) | Minimize the states of the DFA given below | | | (4.5) |
| **PART C** | | | | | |
| ***Answer all questions, each carries3 marks.*** | | | | | |
| 8 |  | Give the CFG for the language **wwR** where w is string of zeroes and ones. | | | (3) |
| 9 |  | What is a derivation tree?  Give an example | | | (2)  (1) |
| 10 |  | Compare DPDA and NPDA. | | | (3) |
| 11 |  | Explain any two closure properties of CFL.( 1.5 x 2) | | | (3) |
| **PART D** | | | | | |
| ***Answer any two full questions, each carries9 marks.*** | | | | | |
| 12 | a) | Proof | | | (4.5) |
|  | b) | PDA for the language **wcwR**. | | | (4.5) |
| 13 | a) | Prove the equivalence of PDA accepting by empty stack and final states | | | (4.5) |
|  | b) | Simplification of grammar  to Chomsky normal form. | | | (2)  (2.5) |
| 14 | a) | Convert to Greibach Normal form. {S→AB, A→SA|AA|a, B→SB|b} | | | (4.5) |
|  | b) | Prove the equivalence of CFG and PDA. | | | (4.5) |
| **PART E** | | | | | |
| ***Answer any four full questions, each carries10 marks.*** | | | | | |
| 15 | a) | Proof | | | (5) |
|  | b) | Universal Turing Machine | | | (5) |
| 16 | a) | Pumping lemma for CFL | | | (5) |
|  | b) | Halting problem | | | (5) |
| 17 | a) | Linear Bounded Automata | | | (5) |
|  | b) | Chomsky hierarchy | | | (5) |
| 18 | a) | Context sensitive grammar for the language anbncnwhere n>0. | | | (5) |
|  | b) | Multi-tape Turing Machine | | | (5) |
| 19 | a) | Design a Turing machine that accepts the language 1n0n where n>0. | | | (5) |
|  | b) | What is a non-deterministic Turing Machine?  Give an example. | | | (3)  (2) |
| 20 | a) | Turing machine tuple explanation  Model | | | (3)  (2) |
|  | b) | Recursive  Recursively enumerable languages | | | (2.5)  (2.5) |
| \*\*\*\* | | | | | |