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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S5 (S, FE) / S3 (PT) (S, FE) Examination December 2023 (2015 Scheme)

Course Code: CS301

Course Name: THEORY OF COMPUTATION

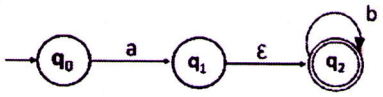
Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions, each carries 3 marks. Marks

1 What do you mean by "acceptance of DFA"? (3)

2 Eliminate epsilon transition from the given NFA. (3)



3 Explain two-way finite automata and its transition function. (3)

4 Find regular expression for: (3)
"all strings not having 2 consecutive **1**'s where $\Sigma = \{0,1\}$"

PART B

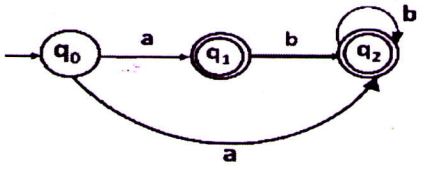
Answer any two full questions, each carries 9 marks.

5 a) Construct NFA for R = 0*(00+1)* 1. (3)

b) Design DFA for the resultant NFA. (6)

6 Prove equivalence of NFA with and without epsilon transitions. (9)

7 Identify regular expression for the finite automata. (9)



PART C

Answer all questions, each carries 3 marks.

8 Check whether $L = \{a^{2i+1} \mid i > 0\}$ is regular or not. (3)

9 List any three closure properties of regular sets. (3)

10 Explain acceptance of push down automata through final state. (3)

11 Design PDA for the grammar with a single state. (3)

$S \rightarrow AS \mid \varepsilon$

$A \rightarrow 0A1 \mid A1 \mid 01$

PART D

Answer any two full questions, each carries 9 marks.

12 a) State and prove pumping lemma for Regular Languages. (6)

b) Show that L = $\{ww | w \in \{a,b\}^*\}$ is not regular. (3)

13 Prove equivalence between NPDA and CFG. (9)

14 Design PDA for L = $\{wcw^R | w \in \{a,b\}^*\}$. Also check whether it is deterministic or not. (9)

PART E

Answer any four full questions, each carries10 marks.

15 Write applications of pumping lemma for CFLs and illustrate with an example. (10)

16 Design a Turing Machine for L = $\{ww^R | w \in (0+1)^*\}$ and check acceptance of the string "001100". (10)

17 Design a Turing Machine for performing proper subtraction. (10)

18 Design Universal Turing Machine using a multi-tape Turing Machine. (10)

19 a) What is meant by recursive and recursively enumerable languages? (5)

b) State and prove Rice's theorem. (5)

20 State and prove halting problem of Turing Machine. (10)

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