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OLE-3229

B. Tech. 5th Semester (CSE) Examination – April, 2021

FORMAL LANGUAGES & AUTOMATA

Paper : PCC-CSE-305-G

Time : Three Hours] ***[Maximum Marks : 75***

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt ***five*** questions in all, selecting ***one*** question from each Unit. Question No. **1** is ***compulsory***. All questions carry equal marks.

1. (a) Draw a diagram of Mealy and a Moore machines. Also process a string of your choice on given diagrams.

(b) Can we use pumping lemma to prove that certain languages are regular? Justify your answer.

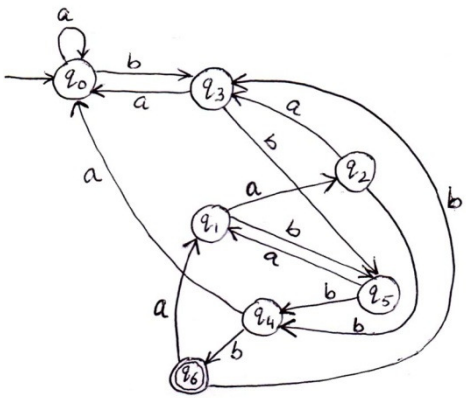
(c) Which machine have more computing power Finite Automat or Pushdown automata ? Justify your answer.

(d) Define Linear Bounded Automata. Also draw the diagram.

(e) What are useless productions and why they are useless in CFG ? Explain by taking a suitable example. $5 \times 3 = 15$

UNIT – I

2. (a) Minimize the given Automata (by using equivalence method only i.e. $\pi 0$, πl, $\pi 2$ method). 8



(b) $M = (\{q_1, q_2, q_3\}, \{0, 1\}, \delta, q_1, \{q_3\})$ is a NDFA, where δ is given by : 7

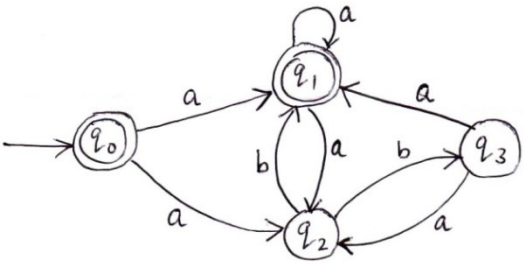
$\delta(q_1, 0) = \{q_2, q_3\}$, $\delta(q_1, 1) = \{q_1\}$

$\delta(q_2, 0) = \{q_1, q_2\}$, $\delta(q_2, 1) = \phi$

$\delta(q_1, 0) = \{q_2\}$, $\delta(q_3, 1) = \{q_1, q_2\}$

Construct an equivalent DFA by converting the states into substates method only.

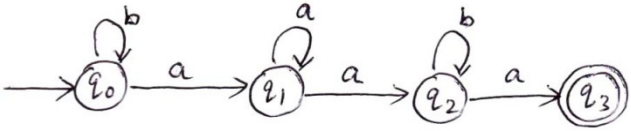
3. (a) Construct a DFA for given NFA (by converting the states into substates method only) : 8



(b) Construct a D F A which accept strings which have substring "baab". 7

UNIT – II

4. (a) Find regular expression for the given diagram : 7

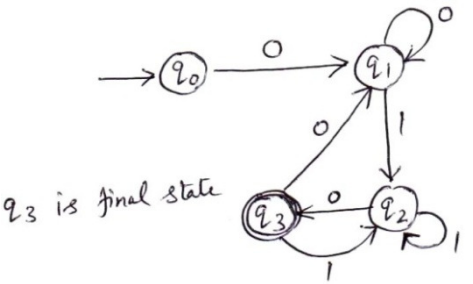


(b) Show that L = $\{a^n b^n c^n \mid n \geq 1\}$ is not regular. 8

5. (a) Construct a DFA for the regular expression. 7

$$r = ba + (a + bb)a^* b$$

(b) Find regular expression for the given diagram : 8



UNIT – III

6. (a) Construct a PDA to accept the palindromes (Transition diagram and table both) 8

(b) Consider the C.F.G. and derive the string ω = baabaabb from the given grammar which is $S \rightarrow aSbS \mid bSaS \mid \varepsilon$ 7

7. (a) Convert the following grammar into G.N.F. 8

$S \rightarrow aAS \mid a$

$A \rightarrow SbA \mid SS \mid ba$

(b) Construct a PDA to accept the language 7

$L = \{a^n b^m a^n \mid n, m \geq 1\}$

UNIT – IV

8. (a) Explain the complete details of Chomsky hierarchy of languages. 10

(b) Design a T.M. which increments the input decimal number by 1. 5

9. (a) Design a Turing Machine to check whether a given unary number is divisible by '3' or not. 8

(b) Write a detailed note on relation between type of grammars in Chomsky hierarchy. 7
