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Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: 02]

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)
Semester: 5th
Name of Subject: Formal Language and Automata Theory
Subject Code: PCCS-110
Paper ID: 16430

Scientific calculator is not allowed.

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) Illustrate the acceptability of a string by a Finite Automata? Give an example for the same.

b) Compare Mealy Machines with Moore Machines.

c) Define Post Correspondence Problem.

d) How Turing machine is important in finding computation of different problems?

e) Determine the language generated by grammar having productions S →aS/aA/a, A →aAb/ab

f) Prove that for any transition function δand two input strings x and y, $\delta(q, xy) = \delta(\delta(q, x), y)$.

Part – B **[Marks: 04 each]**

Q2. Explain the Chomsky classification of formal languages by taking suitable example for each classification.

Q3. State and prove pumping lemma for regular sets.

Q4. Demonstrate the model of Linear Bounded Automata in detail.

Q5. Construct a Deterministic Finite Automata A accepting set of all the words over {a,b}, containing either two consecutive a's or two b's.

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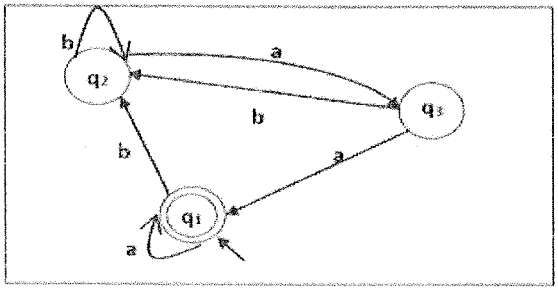
Q6. Discuss various variants of Turing Machine in detail.

Q7. Derive the regular expression for the following Transition Diagram.



Part – C **[Marks: 12 each]**

Q8. How will you differentiate deterministic and non-deterministic finite automata? Construct the deterministic automaton equivalent to $\mathbf{M = (\{q_0, q_1, q_2, q_3, q_4\}, \{0,1,2\}, \delta, q_0, \{q_3\})}$ where δ is:

State	Input		
	0	1	2
→ q_0	q_1, q_2	q_4	q_2, q_3
q_1	---	q_4	---
q_2	---	---	q_2, q_3
((q_3))	---	q_4	---
q_4	---	---	---

OR

What you do mean by simplification of context free grammar? How a grammar can be simplified? Find the reduced grammar equivalent to the given grammar G, whose productions are given below:

$S \rightarrow bA|aB, \quad A \rightarrow bAA|aS|a|C, \quad B \rightarrow aBB|bs|b, \quad D \rightarrow c$

Q9. Design a pushdown automata for language $\{a^n b^n \mid n > 0\}$ using final state. Draw its state transition diagram. Also construct a PDA such that **N(B) = T(A).** Test whether a^3b^3 is in **T(A).**

OR

Distinguish between PDA and TM. Discover a Turing Machine to recognize all strings having an odd number of 1's over {0, 1}. Give the Trace or Instantaneous description for **w = 0011010**

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