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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

IV SEMESTER B.TECH. (COMPUTER SCIENCE AND ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY 2019

SUBJECT: FORMAL LANGUAGES AND AUTOMATA THEORY [CSE 2201]

REVISED CREDIT SYSTEM
(24/4/2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitable assumed.

1A. A binary tree is a tree in which no parent can have more than two children. Prove by induction that a binary tree of height n has at most 2^n leaves. **2**

1B. With an example for each list and explain the types of grammars defined by Chomsky. **4**

1C. Convert the NFA given in Fig 1C. to its equivalent DFA. **4**

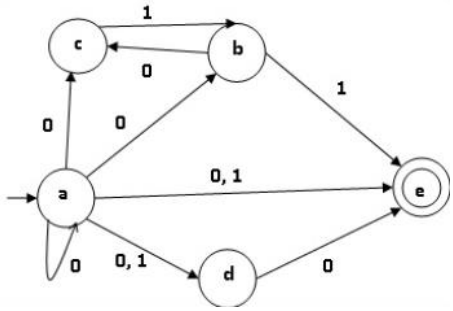

Fig 1C.

2A. Give Right linear grammar for the regular expression 0*(1(0+1))* using only 3 variables(Non terminals). **3**

2B. Draw a DFA to accept the language L1=L(a*baa*) and find language generated from L1/L2 by modifying the DFA for L1 where L2=L(ab*). **3**

2C. Draw the DFA after Minimizing the number of states in the DFA given in Fig 2C. **4**

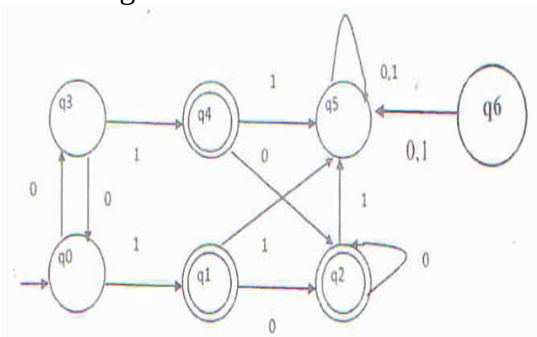

Fig 2C.

3A. What is Turing Machine halting problem? Let A= {011,00,000} and B={110,000,00}. Check whether a Post Correspondence problem exists or not. **3**

3B. Using pumping lemma prove that $L = \{w \mid w = w^R, w \in \{0, 1\}*\}$ is not regular. **3**

3C. Transform the grammar with productions $S \rightarrow abAB$, $A \rightarrow bAB|\lambda$, $B \rightarrow BAa|A|\lambda$ into Chomsky Normal Form. **4**

4A. Show that the $L = \{ a^{n!} \mid n>=0\}$ is not context free. **2**

4B. Design a Turing Machine for the language $L = \{X \in \{a, b\}^* \mid X \text{ ends with aba}\}$ and show its transition using a transition diagram. Also trace the acceptance of the string **'abababa'** using instantaneous description. **4**

4C. Identify the language generated by the grammar S → aSd | aAd , A → bAc | bc and construct PDA for the generated language and show the transitions using the transition diagram. Also trace a sample string generated from the language using instantaneous description. **4**

5A. Explain Turing's thesis as a definition of a mechanical computation. **3**

5B. What is ambiguous grammar? Show that the grammar with the productions: $S \rightarrow aSbS|bSaS|\lambda$ is ambiguous for the string ***"abab"*** using the derivation trees. **3**

5C. Obtain a Turing Machine to accept a string w of 0's and 1's such that the number of 0's (w) is equal to number of 1's (w).Show that the truing machine accepts some valid input. **4**