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

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

MAKE-UP EXAMINATIONS, JUNE 2019

SUBJECT: FORMAL LANGUAGES AND AUTOMATA THEORY [CSE 2201]

REVISED CREDIT SYSTEM
(8/6 /2019)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

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

1A. A rational number is a number that can be expressed as the ration of two integers n and m, so that n and m have no common factor. A real number that is not rational is said to be irrational. Show that sqrt(3) is irrational where sqrt is the square root. **2**

1B. Convert the NFA of Fig.1B to its equivalent DFA, clearly showing all the transition tables. **4**

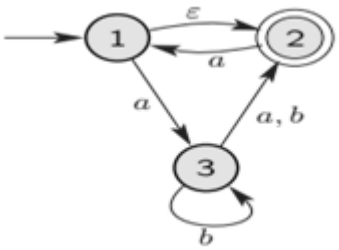

Fig.1B

1C. Find the left linear and right linear grammar for the language: **4**

$L = \{ a^n b^m : n \geq 2, m \geq 3 \}$

2A. What is Turing Machine with Stay-Option? Explain how it is implemented using standard Turing Machine **3**

2B. Draw an NFA to accept the language { w ∈ (0+1)* | w contains at least two 0s, or exactly two 1s } with six states. **3**

2C. When do you say that the grammar is in Greibach Normal Form? Convert the grammar with productions S→ aA/aBB, A→aaA/λ, B→bB/bbC, C→B by removing all λ – production, unit-productions and useless productions to GNF. **4**

3A. Find the regular expression for the language accepted by the automata given in Fig.3A. **4**

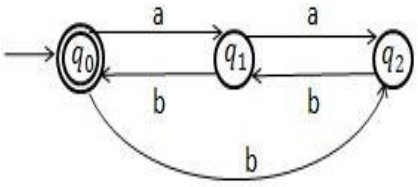

Fig.3A.

3B. Define homomorphism. Let Σ = {a, b}, Γ = {0, 1} , h(a) = 010 and h(b) = 101. If L is the language denoted by *r = 0*101*(0+1)**, find the regular expression for h(L). **2**

3C. Using pumping lemma show that the language L= {a^n : n ≥ 2, is a prime number} is not regular. **4**

4A. What is deterministic pushdown automata? Is the PDA to accept the language L={a^n b^{2n} | n>=1} deterministic? Show the transition and justify with proper explanation. **4**

4B. Design a Turing Machine that accepts L = { a^n b^n c^n | n >= 1} . Show the transition graph and trace the string 'aabbcc' using instantaneous description. **4**

4C. With a neat diagram explain Chomsky hierarchy of formal languages. **2**

5A. Show that the language L = {WW | W ϵ {a,b} * } is not context free. **3**

5B. What is Post Correspondence(PC) problem? Give PC solution for A= {11,100,111} and B= {111,001,11} on ∑= {0,1}. **2**

5C. Obtain a NPDA to accept a string of balanced parentheses. The parentheses considered are (,{,[. **5**