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|  | | **GOVT. MODEL ENGINEERING COLLEGE, THRIKKAKARA (Managed by IHRD, A Govt. of Kerala Undertaking)**  **DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING** | | | | | | | | | |
| **B.TECH. DEGREE FIFTH SEMESTER EXAMINATION**  **COMPUTER SCIENCE AND ENGINEERING**  **FIRST INTERNAL EXAMINATION – SEPTEMBER 2019** | | | | | | | | | **Academic Year:**  **2019-20** | | |
| Slot : **A** | | Course Code: **CS 301** | | | | Course Title: **THEORY OF COMPUTATION.** | | | | | |
| Duration: 1 Hr. | | | | Max. Marks: 20 | | | Faculty Handling the Course: **VINEETHA K V** | | | | |
| ***Course Outcomes:*** *At the end of the course the students will be able to* | | | | | | | | | | | |
| *CS301.1* | | | *Classify formal languages into regular, context- free, context sensitive and unrestricted languages.* | | | | | | | | |
| *CS301.2* | | | *Design finite state automata, regular grammar, regular expression and Myhill- Nerode relation representations for regular languages.* | | | | | | | | |
| **(****Answer All Questions)** | | | | | | | | *Cognitive level* | | ***CO*** | **Marks** |
| 1 | Define Chomsky hierarchy. | | | | | | | *Understanding* | | *CS301.1* | 3 |
| Ans |  | | | | | | |  | |  |  |
| 2 | Write the regular expression for the following language.  set of all strings with at most one pair of consecutive 0's and at most one pair of consecutive 1's. | | | | | | | *Understanding* | | *CS301.1* | 3 |
| Ans | R1 = (0+є)(10)\*(11)(01)\*(0+є) ; strings with one pair of 11  R2 = (1+є)(01)\*(00)(10)\*(1+є) ; strings with one pair of 00  R3 = (1+є)(01)\*(00)(10)\*(11)(01)\*(0+є) ; one pair of zeros before pair of ones.  R4 = (0+є)(10)\*(11)(01)\*(00)(10)\*(1+є) ; one pair of ones before pair of zeros.  R5 = (0+є)(10)\*(1+є) ; srings doesn't have pair of ones and zeros  R = R1+R2+R3+R4+R5 | | | | | | |  | |  |  |
| 3 | Design DFA for the set of all strings beginning with a 1 which, interpreted as the binary representation of an integer, is congruent to zero modulo 5. | | | | | | | *Applying* | | *CS301.2* | 3 |
| Ans | (HINT : δ(qi,a) = qj ; where qi and qj are any states and a is any input symbol, and j=(2\*i+a)mod n.)  0 1  q0 q0 q1  q1 q2 q3  q2 q4 q0  q3 q1 q2  q4 q3 q4  This is what you get when you get when j=(2\*i+a)mod 5 with both initial and final state as q0. This DFA read all binary representation starting with 0. But in the question it is said that all numbers starting with 1 should be accepted. So remove δ(q0,0) = q0 and add a new state q5 and add transitions so that it accept the same language.  So the final answer is  0 1  → q0 - q1  q1 q2 q3  q2 q4 q5  q3 q1 q2  q4 q3 q4  \* q5 q5 q1 | | | | | | |  | |  |  |
| 4 | Differentiate between NFA and DFA. | | | | | | | *Understanding* | | *CS301.2* | 3 |
| Ans | NFA  Nondeterministic  δ : QXΣ → 2Q  More than one transition is possible for each input | | | | DFA  Deterministic  δ : QXΣ →Q  Only one transition for each input symbol | | |  | |  |  |
| 5 | Convert the following NFA to DFA.  NFA, M = ({q0 ,q1 ,q2 ,q3 ,q4}, {0,1}, δ ,q0 , {q3 ,q4})  δ : 0 1  q0  {q0 ,q1 } { q0 }  q1  { q2 ,q3 } {q4}  q2 {q0 ,q2 } {q4}  q3 –------ –-------  q4 –---------- -------- | | | | | | | *Applying* | | *CS301.2* | 4 |
| Ans | Equivalent DFA  0 1  [q0] [ q0 ,q1] [q0 ]  [ q0 ,q1] [ q0 ,q1 ,q2 ,q3 ] [q0 ,q4 ]  [ q0 ,q1 ,q2 ,q3 ] [ q0 ,q1 ,q2 ,q3 ] [q0 ,q4 ]  [q0 ,q4 ] [ q0 ,q1] [q0 ]  Language accepted by FA is any string ending with 00 or 01. | | | | | | |  | |  |  |
| 6 | Minimize the following DFA. (NB: state with → represents initial state and with \* represents final state)  a b  → 1 2 3  2 5 6  \*3 1 4  \*4 6 3  5 2 1  6 5 4 | | | | | | | *Applying* | | *CS301.2* | 4 |
| Ans | |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | 2 | X |  |  |  |  | | 3 | X | X |  |  |  | | 4 | X | X |  |  |  | | 5 | X |  | X | X |  | | 6 |  | X | X | X | X | |  | 1 | 2 | 3 | 4 | 5 |   States 1 and 6, 2 and 5 , 3 and 4 are same  So new DFA is  a b  → [1,6] [2,5] [3,4]  [2,5] [2,5] [1,6]  \* [3,4] [1,6] [3,4] | | | | | | |  | |  |  |