**20CS501/20DS501/20CB501/20IT501**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular) DEGREE EXAMINATION** | | | |
| **February,2023** | **Common to CB,CS,DS & IT Branches** | | |
| **Fifth Semester** | **Automata Theory and Formal Languages** | | |
| **Time:** Three Hours | | **Maximum: 7**0 Marks | |
| *Answer Question No. 1 Compulsorily.* | | | (14X1 = 14 Marks) |
| *Answer* ***ANY ONE*** *question from each Unit.* | | | (4X14=56 Marks) |

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| 1. | a) | | Define Language. | CO1 | L1 | 1M |
|  | b) | | Define NFA | CO1 | L1 | 1M |
|  | c) | | Design NFA which accepts strings containing 011 as substring. | CO1 | L3 | 1M |
|  | d) | | Design DFA ending with 010 over alphabet 0,1. | CO1 | L3 | 1M |
|  | e) | | Define regular expression. | CO2 | L1 | 1M |
|  | f) | | Mention the closure properties of regular languages. | CO2 | L1 | 1M |
|  | g) | | List the applications of pumping lemma. | CO2 | L1 | 1M |
|  | h) | | Construct NFA for regular expression (0+1)\* | CO2 | L3 | 1M |
|  | i) | | Define PDA | CO3 | L1 | 1M |
|  | j) | | State Pumping lemma for context free languages. | CO3 | L1 | 1M |
|  | k) | | Define parse tree. | CO3 | L1 | 1M |
|  | l) | | What is decidable problem? Give examples. | CO4 | L1 | 1M |
|  | m) | | What is universal Turing Machine? | CO4 | L1 | 1M |
|  | n) | | Define Rice theory. | CO4 | L1 | 1M |
| **Unit -I** | | | | | | |
| 2. | a) | | Construct an equivalent DFA for following NFA  Automata Conversion from NFA to DFA - Javatpoint | CO1 | L3 | 7M |
|  | b) | | Construct DFA for L = {w | w is a binary string divisible by 5} | CO1 | L3 | 7M |
|  |  | | **(OR)** |  |  |  |
| 3. | | a) | Construct NFA that accepts set of strings whose 8th symbol from left end is 1 and 10th symbol from left end is 0 over Σ={0,1} | CO1 | L3 | 5M |
|  | | b) | Convert the following Epsilon NFA to DFA:  Automata Conversion from NFA with null to DFA - Javatpoint | CO1 | L3 | 9M |
|  |  | | **Unit -II** |  |  |  |
| 4. | a) | | State and prove pumping lemma for regular languages | CO2 | L3 | 7M |
|  | b) | | Prove that the language L={0n12n,n>=1} is not regular. | CO2 | L3 | 7M |
| **(OR)**  **P.T.O**  **20CS501/20DS501/20CB501/20IT501** | | | | | | |
| 5. | | a) | Construct Epsilon NFA to the regular expression : (00+11)\*(01+10)(00+11)\* | CO2 | L3 | 7M |
|  | | b) | Minimize the following DFA: | CO2 | L2 | 7M |
|  |  | | **Unit -III** | |  |  |
| 6. | a) | | Simplify the following grammar  S🡪aAa | bBb | BB  A🡪C  B🡪S|AC  S🡪€ | CO3 | L3 | 7M |
|  | b) | | Construct PDA for the grammar having productions and Check the string “010000” is accepted or not?  S 🡪0AA  A 🡪 0S | 1S |0 | CO3 | L3 | 7M |
|  |  | | **(OR)** |  |  |  |
| 7. | a) | | Find a grammar in CNF equivalent to G= S🡪bA|aB, A🡪bAA|aS|a, B🡪aBB|bS|b. | CO3 | L3 | 7M |
|  | b) | | Design a PDA to accept the language L={w| w ϵ (a+b)\* and na(w)=nb(w). | CO3 | L3 | 7M |
|  |  | | **Unit -IV** |  |  |  |
| 8. | a) | | Design Turing machine and its transition diagram to accept the language  L = {an bn cn | n >=1} | CO4 | L3 | 7M |
|  | b) | | Illustrate the Decision properties for context free languages. | CO4 | L3 | 7M |
|  |  | | **(OR)** |  |  |  |
| 9. | a) | | Construct a Turing Machine for l={wcwr | Wε(a,b)\*} | CO4 | L3 | 7M |
|  | b) | | Show that the following PCP has a solution and give the solution.   |  |  |  | | --- | --- | --- | |  | List A | List B | | i | Wi | Xi | | 1 | 11 | 111 | | 2 | 100 | 001 | | 3 | 111 | 11 | | CO4 | L3 | 7M |

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