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|  | **PES University, Bangalore**  (Established under Karnataka Act No. 16 of 2013) | UE18CS254 |
| **END SEMESTER ASSESSMENT (ESA) Model QP**  **Jan May 2020**  UE18CS254**- Theory of Computation** | | |
| Time: 3 Hrs Answer All Questions Max Marks: 100 | | |

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| 1. | a) | What is a regular language?Give four differences between deterministic finite automaton(DFA) and non deterministic finite automaton(NFA). | 5 |
| b) | Construct a DFA to accept a's and b's starting with ab. | 5 |
| c) | Construct an NFA for a\*+(ab)\* | 5 |
| d) | Convert the following NFA to its equivalent DFA.    . | 5 |
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| 2. | a) | Obtain regular expression for the following:  i)Language consisting of strings of a’s and b’s that begin with at least two a’s and end with an even number of b’s.  ii)Language consisting of strings of a’s and b’s whose length is a multiple of 3. | 6 |
| b) | Convert the following regular expression to NFA.  (1+(01))\*00(1+(10))\* | 5 |
| c) | Describe the language of the following regular expression:  (ab+ba)\* | 4 |
| d) | Using pumping lemma show that the language L={ | n⩾0} is not regular. | 5 |
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| 3. | a) | Construct grammar for the following regular language:  i)Binary strings in which every 0 is followed by 11.  ii)Set of all even palindromes over {a,b}. | 5 |
| b) | Given the following grammar,  S → a / abSb / aAb  A → bS / aAAb  Show that the grammar is ambiguous by generating two derivations for abababb. | 5 |
| c) | Use CYK algorithm to determine whether or not the given string **baaba** belongs to the grammar.  S → AB / BC  A → BA / a  B → CC / b  C → AB / a | 8 |
| d) | Convert the following grammar into Griebach Normal Form.  S→abS|baS|λ | 2 |
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| 4. | a) | Construct Push Down Automata that accepts the language L over Σ={a,b} :  L={|n≥1} | 6 |
| b) | State and prove pumping lemma for context free languages. |  |
| c) | Convert the following CFG to PDA.  S→aSA|bSb|λ | 8 |
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| 5. | a) | Construct a Turing Machine for language L = {| n≥1} | 8 |
| b) | Explain cantor’s diagonalization. | 6 |
| c) | Explain universal turing machine. | 6 |