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| PES University Logo.jpg | **PES University, Bangalore**  (Established under Karnataka Act No. 16 of 2013) | **UE18CS254** |
| **END SEMESTER ASSESSMENT (ESA) B. TECH IV SEMESTER- May 2020**  **Theory of Computation** UE**18CS254**  **Model Question Paper** | | |
| Time: 3 Hrs Answer All Questions Max Marks: 100 | | |
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| **Note: All answers must be precise and to the point.** | | |

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| 1. | a) | Explain the terms Grammar and Language with example. | 4 |
| b) | Define the language accepted by a DFA and language accepted by NFA | 6 |
| c) | For S = {a,b}, construct DFA, that accept the sets consisting of all strings with no more than three a’s. | 4 |
|  | d) | Convert the NFA given as transition table to equivalent DFA   |  |  |  |  | | --- | --- | --- | --- | | **State** | **Input = *a*** | **Input = *b*** | **Λ** | | *q*0 | {*q*0, *q*1} | {*q*1} | {} | | *q*1 | {*q*2} | {*q*1, *q*2} | {} | | \* *q*2 | {*q*0} | {*q*2} | {*q*1} | | 6 |
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| 2 | a) | Construct Regular expression for each of the following:   1. L = {anbm | n >=4 and m<=3} 2. L = { w | w ∈ {0,1}\* and |w| mod 3 =0} 3. L = { w | w ∈ {a,b}\* and every a in w is immediately precede and followed by b} | 6 |
| b) | Convert the given Finite automata into equivalent regular expression | 4 |
|  | c) | State and prove pumping lemma for regular languages. | 6 |
|  | d) | Find Regular Grammar for the given language on {a,b}  L = (w | ( na(w) -nb(w) ) mod 3 =1} | 4 |
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| 3. | a) | Construct Context free grammar for the following languages,  L = { anbmck |k=n+m}  L = { anbm | n m} | 4 |
| b) | Define npda and context free grammar. | 4 |
| c) | Construct npda for L ={w ∈ {a,b}\* | na(w) > nb(w)} | 6 |
| d) | Define Leftmost derivation, Ambiguous grammar and inherently ambiguous grammar. | 6 |
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| 4. | a) | Explain when the PDA is deterministic and define deterministic pda. | 4 |
| b) | Show that L = {anbn | n>= 0 is a deterministic context free language} | 6 |
| c) | Convert the grammar into Chomsky Normal form | 6 |
| d) |  | 6 |
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| 5. | a) |  | 4 |
| b) | Given two positive integers x and y in unary notation separated by a single zero. Construct a Turing machine to compute x+y. | 6 |
| c) |  | 6 |
|  | d) | Write short notes on Universal Turing machine. | 4 |