

**AUTUMN END SEMESTER EXAMINATION-2018**

**SUBJECT Name-THEORY OF COMPUTATION**

**SUBJECT CODE-CS504 (bACK PAPER 2012)**

Time: 3 Hours Full Marks: 60

***Answer any SIX questions including question No.1 which is compulsory.***

*The figures in the margin indicate full marks.*

*Candidates are required to give their answers in their own words as far as practicable and all parts of a question should be answered at one place only.*

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| 1. |  |  | [210] |
|  | (a) | A language L is accepted by PDA if and only if it is   1. Regular Language 2. CSL 3. Expressible by CFG 4. Expressible by right-linear grammar |  |
|  | (b) | Does Push Down Automata have memory? Justify. |  |
|  | (c) | The language {ambncm+n | m, n ≥ 1} is  i. regular  ii. context-free but not regular  iii. context sensitive but not context free  iv. type-0 but not context sensitive |  |
|  | (d) | Differentiate PDA accepted by empty stack method with acceptance by final state. |  |
|  | (e) | What is Halting problem? |  |
|  | (f) | Give the CFG generating L= {aibj | i≠j}. |  |
|  | (g) | Construct a minima DFA for the regular language L={ } over  Σ={a,b} |  |
|  | (h) | If L1= {101, 011, 0010, 00}, L2= {1,0}, L3= {00}. Find the values of L1/L2, L1/L3 and L3/L2? |  |
|  | (i) | Which of the following are regular sets?  i. {anb2m | n≥ 0, m ≥ 0}  ii. { anbm | n =2m}  iii. { anbm | n ≠ m}  iv. {xcy |x, y Є {a, b}\*} |  |
|  | (j) | Select two incorrect statements out of the following  i. The expressive power of DFA and NFA are same.  ii. The expressive power of DPDA and NPDA are same.  iii. The expressive power of DTM and NTM are same.  iv. The expressive power of DLBA and NLBA are same. |  |
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| 2. | (a) | What is the purpose of Normalization? Give the Greibach Normal Form generating the language L={anbn|n≥1}. | [3] |
|  | (b) | Write short note on Chomsky Hierarchy. | [3] |
|  | (c) | Define an s-grammar. Find an s-grammar for L={anbn|n≥1}. | [2] |
| 3. | (a) | Find Chomsky Normal Form grammar generating the set of all palindromes over {a, b}. | [4] |
|  | (b) | Give the CFG generating all balanced parenthesis. Construct a PDA to accept the languages of balanced parenthesis. | [4] |
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| 4. | (a) | Given the grammar E →E+E |E×E |a, identify if the Grammar G is ambiguous? If so, convert it into equivalent unambiguous grammar. Construct a rightmost derivation for the string a + b\*c. | [4] |
|  | (b) | Construct a Turing Machine(TM) for the language L={anbn|n>=1}. | [4] |
|  |  |  |  |
| 5. | (a) | Construct a PDA that accepts { wwR | w Є (0+1)\* }. Is it deterministic or nondeterministic? | [4] |
|  | (b) | Construct a PDA for the language L={anb2n|n>=1}. | [4] |
|  |  |  |  |
| 6. | (a) | Prove L= {ap| p is prime number} is non regular using pumping Lemma. | [4] |
|  | (b) | Construct a minimal DFA which accepts L= {anbmcl | n, m, l>=1} over Σ= {a, b, c}. | [4] |
|  |  |  |  |
| 7. | (a) | Find an equivalent regular expression for the following finite automata. | [4] |
|  | (b) | b. Construct an NFA and DFA for the following regular expression R=a\*bb\* | [4] |