Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058, India
(Autonomous College Affiliated to University of Mumbai)

ESE Examination

Max. Marks: 60 November 2020 Duration: 120 min.
Class: T.E. (V) Computer/IT Course Code: CE55/IT54
Name of the Course: Theoretical Computer Science

Instructions:
(1) All questions are compulsory
(2) Draw neat diagrams
(3) Assume suitable data if necessary

Q. No.		Max Marks	CO-BL-PI
Q.1	Design finite automata for the language (**Attempt any Two**) 1. $\Sigma = \{a,b\}$ L= {w | w contains odd number of 'a' and ends with 'ab'} 2. $\Sigma = \{0,1\}$ L= {w | w contains an equal number of occurrences of 01 and 10 } 3. $\Sigma = \{a,b,c\}$ L={w | $\|w\|_a + \|w\|_b \equiv 0$ or 2 mod 3 } 4. $\Sigma = \{a,b\}$ L= {w | $\|w\| = 2+3n$, $n \geq 0$ }	16	1-3-1.1.1
Q.2	Using pumping lemma determine whether the languages $L_{rev} = \{ ww^r \mid w \in \{0,1\}^*\}$ where, a word w^r be reverse of w is regular or non-regular	10	2-3-1.1.1
Q.3	Design Turing Machine for the language $L= \{ a^i b^j c^k \mid i, j, k \geq 1 , i = j + k \}$	14	4-3-1.1.1
Q.4	Construct a push down automata to recognize the language $L = \{a^n b^{2m} c^m d^{3n} \mid m, n \geq 1$. Check the output of PDA with valid & invalid input given by user. OR Construct the Context free grammar equivalent to following PDA $\delta (q_0, b, Z_0) = (q_0, ZZ_0)$ $\delta (q_0, \varepsilon, Z_0) = (q_0, \varepsilon)$ $\delta (q_0, b, Z) = (q_0, ZZ)$ $\delta (q_0, a, Z) = (q_1, Z)$ $\delta (q_1, b, Z) = (q_0, \varepsilon)$ $\delta (q_1, a, Z_0) = (q_0, Z_0)$	10	4-4-2.2.3

Q.5	Simplify the following grammar and convert it into CNF S → a / aA / B / C A → aB / ε B → Aa C → aCD D → ddd	10	3-3-1.4.1