Sardar Patel Institute of Technology
Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai: 400058, India
(Autonomous college Affiliated to Mumbai University)

End Semester Examination
November 2018
Synoptic

Max Marks: 60	Duration: 3 hrs
Class: TE	Semester: V
Course Code: IT54/CE55	Branch: IT/Computer
Name of the Course: Theoretical Computer Science	

Q. No		Max Marks
Q. 1(a)	Using Pumping Lemma prove that the following languages are not regular L = {0^i | i is prime number} L = {WW| W ∑ (a,b) } Define pumping Lemma conditions Solution for L = {0^i | i is prime number} is not regular with justification Define pumping Lemma conditions Solution for L = {WW| W ∑ (a,b)*} is not regular with justification	06 01 02 01 02

Q. 1(b)	Check whether following PCP have solution? Justify your answer.
	A = {10,011,101} and B = {101,11,011}
	A = {1,10111,10} and B = {111,10,0}
	
	Define PCP
	A = {10,011,101} and B = {101,11,011}, solution with justification
	A = {1,10111,10} and B = {111,10,0}, solution with justification
		06
		
		02
		02
		02

Q. 2(a)	Give the technical strategy to convert the given CFG to GNF Covert the following grammar to GNF A1→A2A3 A2 → A3A1 | b A3 → A1A2 | a Define Greibach normal form Conversion steps of CFG to GNF Conversion of A1, A2, A3 & X in GNF	06 01 02 03
Q. 2(b)	Design Equivalent PDA for E → E + E | E * E | id Converting the grammar in Greibach Normal Form (GNF). Define grammar as M = (V,T,P,S) Converting GNF in PDA Define PDA as M = (Q, ∑, q0, i/p function, stack symbol, Z_0, F)	06 02 01 02 01

Q. 3(a)	Design PDA for string containing equal numbers of a's and b's.	06
	1. Define M = (Q, ∑, q0, i/p function, stack symbol, Z_0, F)	02
	2. Transition Diagram	02
	3. Transition Function	02
	OR	
	Design PDA for L = { $WCW^R \mid W$ belongs to ∑ (a,b)* }.	06
	4. Define M = (Q, ∑, q0, i/p function, stack symbol, Z_0, F)	02
	5. Transition Diagram	02
	6. Transition Function	02
Q. 3(b)	Let G be the grammar, find leftmost derivation, Right most derivation and parse tree for the string 00110101, 011101111 $S \rightarrow 0B \mid 1A$ $A \rightarrow 0 \mid 0S \mid 1AA$ $B \rightarrow 1 \mid 1S \mid 0BB$	06
	Leftmost derivation, Rightmost derivation and parse tree for 00110101	1M each
	Leftmost derivation, Rightmost derivation and parse tree for 011101111	1M each
Q. 4(a)	Design Turing machine to compare two numbers m & n such that I/p→ 0^m 1 0^n O/p→ G if m>n E if m=n L if m<n	06
	7. Define M = (Q, ∑, q0, i/p function, i/p tape symbol, B, F)	02
	8. Transition Diagram	02
	9. Transition Table	02
	OR	
	Design Turing machine to recognize Palindrome over ∑ (a,b).	06
	1. Define M = (Q, ∑, q0, i/p function, i/p tape symbol, B, F)	02
	2. Transition Diagram	02
	3. Transition Table	02

Q. 4(b)	Write Arden's theorem and Find the regular expression that contain odd number of a's over input (a,b).	06
	Arden's Theorem Explanation	01
	Finite automata for give problem	02
	Equations in terms of states	01
	Equations in terms of input for states	02
	OR	
	Design Moore machine to "print residue modulo 4 for binary numbers". Convert the Moore machine to mealy machine.	06
	Define M=(Q, ∑, i/p function, o/p, o/p function, initial state)	01
	State transition table and o/p function	02
	Transition diagram	01
	Moore m/c to Mealy m/c conversion with justification	02
Q. 5	Write short note on	
	1. Halting Problem	04
	Define Halting Problem	01
	Justification of Halting problem with example	03
	2. Recursive & recursively enumerable languages	04
	Explanation of Recursive languages	02
	Explanation of Recursively Enumerable languages	02
	3. Chomsky Hierarchy	04
	Type 0 grammar explanation with example	01
	Type 1 grammar explanation with example	01
	Type 2 grammar explanation with example	01
	Type 3 grammar explanation with example	01