K. J. Somaiya College of Engineering, Mumbai-77 (Autonomous College Affiliated to University of Mumbai)

End Semester Exam MAY-JUNE 2021

Max. Marks: 50

Duration: 1 Hr. 45 Min.

Class: SY B.Tech
Name of the Course: Theory of Automata with Compiler Design

Semester: IV
Branch: Computer

Course Code: 2UCC404

Instructions:

(1) All questions are compulsory

(2) **Draw neat diagrams**

(3) Assume suitable data if necessary

Question		Max
No.		Marks
Q1 (A)	1. $(P + Q)^* =$	
	i) (P Q*)*	
	ii) P* + Q*	
	iii) (P* Q*)*	
	iv) None	
	2. Which of the following sets are regular?	
	$i) \{ a^i i = n2, n >= 1 \}$	
	ii) { a ^p p is prime }	
	$ iii) \{ ww w \in \{a, b\} + \}$	
	$ iv) \{ a^{2n} n >= 1 \}$	
	3. Consider the CFG as defined:	
		10
	X -> XY	(1Mark
	$X \rightarrow aX / bX / a$	each)
	$Y \rightarrow Ya / Yb / b$	
	Any string of terminals, which can be generated by the CFG	
	i) Has at least one b	
	ii) Ends with a	
	iii) Has no consecutive a's and b's	
	iv) Has at least 2 a's.	
	4. A Mealy machine accepts a string of length k; the output string length is	
	i) k	
	ii) 2k	
	iii) k + 1	
	iv) k - 1	

i) $S \rightarrow aA$ ii) $SA \rightarrow AS$ iii) $S \rightarrow AB$ iv) All of these 6. Consider the grammar: $S \rightarrow aSAb \mid c$; $A \rightarrow bA \mid c$; The grammar generates strings in the form aibi for some i, j >=0. What are the conditions for i & j? i) $i = j$ ii) $j \leftarrow 2i$ iii) $j \leftarrow 2i$ iii) $j \leftarrow 2i$ iv) $i \leftarrow j$ 7. The string 1101 does not belong to the set represented by i) $110^{\infty}(0+1)$ ii) $1(0+1)^{\infty}101$ iii) $1(0)^{\infty}(0)^{\infty}(0)^{\infty}(00+11)^{\infty}$ 8. Let L be the language represented by the Regular Expression $\Sigma^{\infty}0011\Sigma^{\infty}$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes $-L$ (complement of L)? i) A ii) B iii) B iii) B iii) B iv) B 9. Let B 11. X2 12. B 12. B 13. B 14. B 15. B 16. B 17. They are related as follows: X1 = 1X2 X2 = 0X2 + 1X3 X3 = 0X2 + c Which of the following choices precisely represent the string in X1? i) B ii) B 16. B 17. They are related as B 18. B 19. Let B 10. B 10. B 11. B 11. B 12. B 13. B 14. B 15. B 16. B 17. They are related as B 18. B 19. Let B 10. B 10. B 10. B 11. B 11. B 11. B 12. B 12. B 13. B 14. B 15. B 16. B 17. B 18. B 18. B 19. Let B 19. B 10. B 10. B 10. B 10. B 10. B 11. B 11. B 12. B 12. B 13. B 14. B 15. B 16. B 16. B 17. B 18. B 18. B 18. B 18. Let B 19. B 19. B 10. B 10. B 10. B 10. B 10. B 11. B 11. B 12. B 12. B 13. B 14. B 15. B 16. B 16. B 17. B 18. Let B 18. Let B 19. B 19. B 19. B 10. B 11. B 11. B 12. B 12. B 13. B 14. B 15. B 16. B 16. B 17. B 18. Let B 18. Let B 18. Let B 19. B 19. B 19. B 10. B 10. B 10. B 10. B 10. B 11. B 11. B 11. B 11. B 12. B 12. B 13. B 14. B 15. B 16. B 17. B 18. Let B 18. Let B 19. B 19. B 19. B 19. B 19. B 10. B	5. Which of the following production rule is in CNF?	
ii) SA >AS iii) S ->AB iv) All of these 6. Consider the grammar: $S \rightarrow aSAb \mid \epsilon; A \rightarrow bA \mid \epsilon;$ The grammar generates strings in the form aibi for some i, j >=0. What are the conditions for i & j? i) i = j ii) j <= 2i iii) j >= 2i iii) j >= 2i iv) i <= j 7. The string 1101 does not belong to the set represented by i) $110^*(01+1)$ ii) $1(01^*(01)^*(00-11)^*$ iv) $(00+(11)^*01)^*$ 8. Let L be the language represented by the Regular Expression $\Sigma^*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes \sim L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \epsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $10(0^* + (10)^*)1 + 110(0 + 10)^*1$ iv) $10(0^* + (10)^*)1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ ii) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	i) S ->aΔ	
iii) S ->AB iv) All of these 6. Consider the grammar: $S > aSAb \mid \epsilon; A > bA \mid \epsilon;$ The grammar generates strings in the form aibi for some $i, j >= 0$. What are the conditions for $i \& j$? i) $i = j$ ii) $j <= 2i$ iii) $j <= 2i$ iii) $j >= 2i$ iv) $i <= j$ 7. The string 1101 does not belong to the set represented by i) $110^*(0+1)$ ii) $1(0+j)^*101$ iii) $(10)^*(01)^*(00+11)^*$ iv) $(00+(11)^*01)^*$ 8. Let L be the language represented by the Regular Expression $\Sigma^*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes $\sim L$ (complement of L)? i) A ii) S iii) G iv) S 9. Let $X1, X2, X3$ be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \epsilon$ Which of the following choices precisely represent the string in $X1$? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $10(0^* + (10)^*)1$ iii) $10(0^* + (10)^*)1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(q, a) \cup \delta(q, b)$ iii) $\delta(q, a) \cup \delta(q, b)$ iiii) $\delta(q, a) \cup \delta(q, b)$		
iv) All of these 6. Consider the grammar: $S > aSAb \mid \epsilon; A > bA \mid \epsilon;$ The grammar generates strings in the form aibi for some $i, j >= 0$. What are the conditions for $i \& j$? i) $i = j$ ii) $j <= 2i$ iii) $j <= 2i$ iv) $i <= j$ 7. The string 1101 does not belong to the set represented by i) $110^*(0) + 10$ ii) $1(0)^*(0)^*(0) + 10$ iii) $(10)^*(0)^*(0) + 11)^*$ iv) $(00)^*(11)^*(0) + 11)^*$ 8. Let L be the language represented by the Regular Expression $\Sigma^*(0) = 0$ ii) $\Sigma^*(0) = 0$ ii) $\Sigma^*(0) = 0$ ii) $\Sigma^*(0) = 0$ iii) $\Sigma^*(0) = 0$ iv) $\Sigma^*(0) = 0$ i		
6. Consider the grammar: $S > aSAb \mid \epsilon$; $A > bA \mid \epsilon$; The grammar generates strings in the form aibi for some i, j >=0. What are the conditions for i & j? i) $i = j$ ii) $j <= 2i$ iii) $j <= 2i$ iii) $j <= 2i$ iv) $i <= j$ 7. The string 1101 does not belong to the set represented by i) $110*(0+1)$ ii) $1(0+1)*101$ iii) $(10)*(01)*(00+11)*$ iv) $(00+(11)*01)*$ 8. Let L be the language represented by the Regular Expression $\Sigma*0011\Sigma*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes \sim L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0*+(10)*)1$ ii) $10(0*+(10)*)1$ iii) $10(0*+(10)*)1$,	
The grammar generates strings in the form aibi for some i, j>=0. What are the conditions for i & j? i) i = j ii) j <= 2i iii) j <= 2i iii) j >= 2i iii) j >= 2i iii) j >= 2i iv) i <= j 7. The string 1101 does not belong to the set represented by i) $110^*(0+1)$ ii) $1(0+1)^*(0+1)$ iii) $(10)^*(01)^*(00+11)^*$ iii) $(10)^*(01)^*(00+11)^*$ iv) $(00+(11)^*01)^*$ 8. Let L be the language represented by the Regular Expression $\Sigma^*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes \sim L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2 X2 = 0X2 + 1X3 X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)^*1$ ii) $10(0^* + (10)^*)^*1$ iii) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ ii) $\delta(q, a) \cup \delta(q, b)$ iii) $\delta(q, a), b$ iiii) $\delta(q, a), b$ iiii) $\delta(q, a), b$ iiii) $\delta(q, a), b$		
the conditions for i & j? i) $i=j$ ii) $j <= 2i$ iii) $j <= 2i$ iii) $j >= 2i$ iv) $i <= j$ 7. The string 1101 does not belong to the set represented by i) $110^*(0+1)$ ii) $1(0+1)^*101$ iii) $1(0)^*(0)^*(0)^*(0)^*(0)^*(0)^*(0)^*(0)^*$		
i) $i=j$ ii) $j <= 2i$ iii) $j >= 2i$ iv) $i <= j$ 7. The string 1101 does not belong to the set represented by i) $110^*(0+1)$ ii) $1(0+1)^*101$ iii) $1(0)^*(01)^*(00)^*(00)^*$ 8. Let L be the language represented by the Regular Expression $\Sigma^*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes $\neg L$ (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ ii) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(q, a)$, b) iii) $\delta(q, b)$, a)		
ii) $j <= 2i$ iii) $j >= 2i$ iv) $i <= j$ 7. The string 1101 does not belong to the set represented by i) $110*(0+1)$ ii) $1(0+1)*101$ iii) $(10)*(01)*(00+11)*$ iv) $(00+(11)*01)*$ 8. Let L be the language represented by the Regular Expression $\Sigma*0011\Sigma*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(q, a)$, b) iii) $\delta(q, a, b)$	the conditions for 1 & j?	
iii) $j >= 2i$ iv) $i <= j$ 7. The string 1101 does not belong to the set represented by i) $110^*(0+1)$ ii) $1(0+1)^*101$ iii) $(10)^*(01)^*(00+11)^*$ iv) $(00+(11)^*01)^*$ 8. Let L be the language represented by the Regular Expression $\Sigma^*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes $\neg L$ (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(q, a, b)$ iii) $\delta(q, a, b)$ iii) $\delta(q, b, a)$	i) i = j	
iv) $i <= j$ 7. The string 1101 does not belong to the set represented by i) $110^*(0+1)$ ii) $1(0+1)^*(01)$ iii) $1(0)^*(01)^*(00+11)^*$ iv) $(00+(11)^*01)^*$ 8. Let L be the language represented by the Regular Expression $\Sigma^*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)^*1$ ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	ii) $j \le 2i$	
7. The string 1101 does not belong to the set represented by i) $110*(0+1)$ ii) $1(0+1)*101$ iii) $1(0+1)*101$ iii) $1(0)*(01)*(00+11)*$ iv) $(00+(11)*01)*$ 8. Let L be the language represented by the Regular Expression $\Sigma*0011\Sigma*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? ii) $10(0^* + (10)^*)1$ iii) $1(0^* + (10)^*)1$ iii) $1(0^* + (10)^*)1$ iv) $10(0^* + (10)^*)1 + (10)^*$ 10. Which is true for the transition statement: $\delta(q, ab)$ ii) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	iii) $j \ge 2i$	
i) $110*(0+1)$ ii) $1(0+1)*101$ iii) $1(0)*(01)*(00)*(00+11)*$ iv) $(00+(11)*01)*$ 8. Let L be the language represented by the Regular Expression $\Sigma*0011\Sigma*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0*+(10)*)1$ ii) $10(0*+(10)*)1$ iii) $10(0*+(10)*)1$	iv) i <= j	
i) $110*(0+1)$ ii) $1(0+1)*101$ iii) $1(0)*(01)*(00)*(00+11)*$ iv) $(00+(11)*01)*$ 8. Let L be the language represented by the Regular Expression $\Sigma*0011\Sigma*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0*+(10)*)1$ ii) $10(0*+(10)*)1$ iii) $10(0*+(10)*)1$	7. The string 1101 days not belong to the set manner at the	
ii) $1(0+1)*101$ iii) $(10)*(01)*(00+11)*$ iv) $(00+(11)*01)*$ 8. Let L be the language represented by the Regular Expression $\Sigma*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: X1 = 1X2 X2 = 0X2 + 1X3 X3 = 0X2 + ε Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $10(0^* + (10)^*)1$ iii) $10(0^* + (10)^*)1$ iii) $10(0^* + (10)^*)1$ iii) $10(0^* + (10)^*)1$ iv) $10(0^* + (10)^*)1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	7. The string 1101 does not belong to the set represented by	
iii) $(10)*(01)*(00+11)*$ iv) $(00+(11)*01)*$ 8. Let L be the language represented by the Regular Expression $\Sigma*0011\Sigma*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0*+(10)*)1$ ii) $10(0*+(10)*)1$ iii) $10(0*+(10)*)1$	i) 110*(0+1)	
iv) $(00+(11)*01)*$ 8. Let L be the language represented by the Regular Expression $\Sigma*0011\Sigma*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0*+(10)*)1$ ii) $10(0*+(10)*)1$ iii) $10(0*+(10)*)1$	ii) 1(0+1)*101	
8. Let L be the language represented by the Regular Expression $\Sigma^*0011\Sigma^*$ where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: X1 = 1X2 X2 = 0X2 + 1X3 X3 = 0X2 + ε Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + (10)^*)1$ iii) $1(0 + (10)^*)1$ iv) $10(0^* + (10)^*)1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(q, a) \cup \delta(q, b)$ iii) $\delta(q, a) \cup \delta(q, b)$	iii) (10)*(01)*(00+11)*	
where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: X1 = 1X2 X2 = 0X2 + 1X3 X3 = 0X2 + ε Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	iv) (00+(11)*01)*	
where $\Sigma = \{0, 1\}$. What is the minimum number of states in a DFA that recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: X1 = 1X2 X2 = 0X2 + 1X3 X3 = 0X2 + ε Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	Q I at I he the language names anted by the Decyclen Evances in \$\times \tau 0.0115\tau	
recognizes ~L (complement of L)? i) 4 ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + 10)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, a), b)$		
ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
ii) 5 iii) 6 iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
iii) 6 iv) 8 $9. \text{ Let } X1, X2, X3 \text{ be strings with the alphabet } \Sigma \in \{0, 1\}^*. \text{ They are related as follows:}$ $X1 = 1X2$ $X2 = 0X2 + 1X3$ $X3 = 0X2 + \varepsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + (10)^*)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ $10. \text{ Which is true for the transition statement: } \delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
iv) 8 9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: X1 = 1X2 X2 = 0X2 + 1X3 X3 = 0X2 + ε Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, a), b)$		
9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related as follows: $ X1 = 1X2 \\ X2 = 0X2 + 1X3 \\ X3 = 0X2 + \varepsilon $ Which of the following choices precisely represent the string in X1? $ i) \ 10(0^* + (10)^*)1 \\ ii) \ 10(0^* + (10)^*)1 \\ iii) \ 10(0^* + (10)^*)1 \\ iii) \ 10(0^* + (10)^*)1 \\ iii) \ 10(0^* + (10)^*)1 + 110(0 + 10)^*1 \\ 10. Which is true for the transition statement: \delta(q, ab) i) \ \delta(q, a) \cup \delta(q, b) \\ ii) \ \delta(\delta(q, a), b) \\ iii) \ \delta(\delta(q, b), a) $		
as follows: $ X1 = 1X2 \\ X2 = 0X2 + 1X3 \\ X3 = 0X2 + \varepsilon $ Which of the following choices precisely represent the string in X1? $ i) \ 10(0^* + (10)^*)1 \\ ii) \ 10(0^* + (10)^*)1 \\ iii) \ 10(0^* + (10)^*)1 \\ iii) \ 1(0 + 10)^*1 \\ iv) \ 10(0^* + (10)^*)^*1 + 110(0 + 10)^*1 \\ 10. \text{ Which is true for the transition statement: } \delta(q, ab) \\ i) \ \delta(q, a) \cup \delta(q, b) \\ ii) \ \delta(\delta(q, a), b) \\ iii) \ \delta(\delta(q, b), a) $	IV) 8	
as follows: $ X1 = 1X2 \\ X2 = 0X2 + 1X3 \\ X3 = 0X2 + \varepsilon $ Which of the following choices precisely represent the string in X1? $ i) \ 10(0^* + (10)^*)1 \\ ii) \ 10(0^* + (10)^*)1 \\ iii) \ 10(0^* + (10)^*)1 \\ iii) \ 1(0 + 10)^*1 \\ iv) \ 10(0^* + (10)^*)^*1 + 110(0 + 10)^*1 \\ 10. \text{ Which is true for the transition statement: } \delta(q, ab) \\ i) \ \delta(q, a) \cup \delta(q, b) \\ ii) \ \delta(\delta(q, a), b) \\ iii) \ \delta(\delta(q, b), a) $	9. Let X1, X2, X3 be strings with the alphabet $\Sigma \in \{0, 1\}^*$. They are related	
$X2 = 0X2 + 1X3$ $X3 = 0X2 + \epsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
$X2 = 0X2 + 1X3$ $X3 = 0X2 + \epsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	V1 1V2	
$X3 = 0X2 + \epsilon$ Which of the following choices precisely represent the string in X1? i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
i) $10(0^* + (10)^*)1$ ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	Which of the following choices precisely represent the string in X1?	
ii) $10(0^* + (10)^*)^*1$ iii) $1(0 + 10)^*1$ iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	i) 10(0* + (10)*)1	
iii) $1(0 + 10)*1$ iv) $10(0* + (10)*)*1 + 110(0 + 10)*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
iv) $10(0^* + (10)^*)^*1 + 110(0 + 10)^*1$ 10. Which is true for the transition statement: $\delta(q, ab)$ i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
i) $\delta(q, a) \cup \delta(q, b)$ ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$		
ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	10. Which is true for the transition statement: $\delta(q, ab)$	
ii) $\delta(\delta(q, a), b)$ iii) $\delta(\delta(q, b), a)$	$(i) \delta(q, a) \cup \delta(q, b)$	
iii) $\delta(\delta(q, b), a)$		
	 iv) $\delta(q, a) \cap \delta(q, b)$	

O1 (D)	Attempt any EIVE questions out of the fall arrive (our 5 and 4.7)	10
Q1 (B)	Attempt any FIVE questions out of the following (any 5 out of 7)	10 (2 Marks
	a. Prove that the following grammar is not regular. $L=\{0^n1^{2n} \mid n>=0\}$	each)
	b. State closure properties of context free grammar.	
	c. Construct Finite Automata for even length string on {0,1} not having any two same consecutive symbols.	
	d. Compare FA with PDA on the basis of their formal definition, transition function and memory unit.	
	e. What is undecidability?	
	f. Show that recursive language is closed under union.	
	g. Explain derivation tree with example.	
Q. 2	Attempt any two:	10
	a. Convert the given grammar into GNF	(5 Marks each)
	$E \rightarrow E + T / T$	
	$T \rightarrow T * F / F$ $F \rightarrow (E) / a$	
	b. Find the equivalent grammar after the elimination of null production for the given grammar.	
	$S \rightarrow AB / aSa$ $A \rightarrow aAA / \varepsilon$	
	$B \rightarrow bBB / \epsilon$	
	c. Convert the given NFA with epsilon move into DFA	
	ϵ q_1 0	
	$\underbrace{\text{Start}}_{\mathbf{q}_0} \underbrace{\mathbf{q}_3}_{\mathbf{q}_4} \underbrace{\mathbf{q}_4}_{\mathbf{q}_4}$	
	ϵ q_2 1	
Q. 3	Construct PDA for accepting all strings over {0, 1}, with equal number of 0s and 1s. Show the working of Automata by considering any input string.	10
	OR	
	Obtain a CFG, equivalent to given below PDA: $M=(\{q0,q1,q2\},\{0,1\},\{Z0,A),\delta,q0,Z0,\Phi)$	

	Where δ is given as :	
	(q0,0,Z0)=(q1,AZ0) (q1,0,A)=(q1,AA) (q1,1,A)=(q2, A) $(q2,1,A)=(q2, \epsilon)$ $(q2, \epsilon, Z0)=(q2, \epsilon)$	
Q. 4	Explain the following:	10
	a. Multitape Turing Machine	
	b. Turing Machine as a computer of Integer Function with example.	