Total No. of Printed Pages: 02

PRN No.	

PAPER CODE	U314-2104 (ES)

(AY:2024-25) December 2024 (ENDSEM) EXAM

TY (SEMESTER - I)

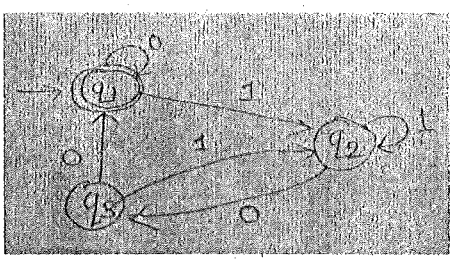
COURSE NAME: FORMAL LANGUAGE & AUTOMATA THEORY **Branch: IT** **COURSE CODE: ITUA31204**

T.Y PATTERN 2020

Time: [1Hr 30 Min] **[Max. Marks: 40]**

Instructions to candidates:

1) **Figures to the right indicate full marks. Use of scientific calculator is allowed**
2) **Use suitable data wherever required**
3) **All questions are compulsory. Solve any two sub question each from Questions 1 and 2**
4) **Solve any one sub question (2 marks) from Questions 3 ,4 ,5 and 6 and sub question of 4 marks is compulsory from questions 3,4,5,and 6**

Q. No.	Question Description	Max. Marks	CO mapped	BT Level
Q.1	a) Convert the following NFA to DFA | Q\ Σ | 0 | 1 | | p(initial state) | {p,q} | {p} | | q | ϕ | {r} | | r(final state) | {p,r} | {q} |	[4]	[1]	[3]
	b) Construct a Mealy machine to find the 2's complement of a given binary number.	[4]	[1]	[3]
	c) Write formal definition of finite automata. Differentiate between NFA and DFA.	[4]	[1]	[3]
Q2	a) Design FA for the Regular expression: (0+1)*(00+11)(0+1)*	[4]	[2]	[3]
	b) Explain Pumping Lemma to decide language is not regular.	[4]	[2]	[2]
	c) Find the RE for given FA following using Arden's theorem.  	[4]	[2]	[3]

Q3	a) Identify the CFG for the Regular Expressions (a+b)*a(a+b)*a(a+b)*	[2]	[3]	[3]
	OR			
	b) Identify the CFG for the Regular Expressions (a+b)*bbb(a+b)*	[2]	[3]	[3]
	c) Show the leftmost and rightmost derivation for the string "001100" by considering the grammar G= {(S, A), (0,1), P, S} where P consists of: S→0AS|0, A→S1A|SS|1.	[4]	[3]	[3]
Q4	a) What are types of PDA? Write the formal definition of a PDA.	[2]	[4]	[2]
	OR			
	b) Write closure properties of CFL.	[2]	[4]	[2]
	c) Construct PDA for Language $L = \{a^n b^m a^n \mid m,n>=0\}$	[4]	[4]	[3]
Q.5	a) Explain types of Turing Machine.	[2]	[5]	[2]
	OR			
	b) Explain power of Turing Machine over Finite Automata.	[2]	[5]	[2]
	c) Design Turing machine that recognizes binary palindromes.	[4]	[5]	[3]
Q.6	a) Explain class P and NP.	[2]	[6]	[2]
	OR			
	b) Explain decidability and undecidability	[2]	[6]	[2]
	c)Differentiate between Recursive Languages and Recursively Enumerable Languages.	[4]	[6]	[2]

*BT levels: 1-Remember, 2-Understand, 3-Apply, 4-Analyse,5-evaluate, 6-Create