

**Course: B.Tech Computer Science and Engineering**  
**(Artificial Intelligence & Machine Learning)**  
**Subject: Theory of Computation**  
**Subject Code: ETCS-301**  
**Semester: V**

**Time: 03 Hours**

**Max Marks: 70**

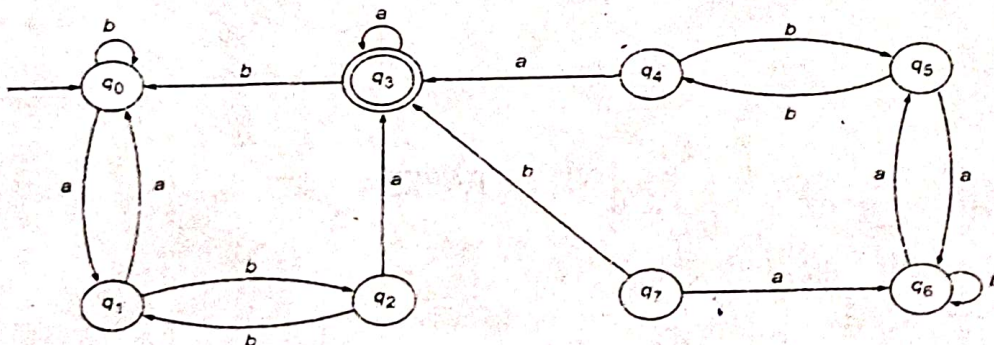
**Instructions to the Students:**

1. This Question paper consists of two Sections. All sections are compulsory.
2. Section A comprises 10 questions of short answer type. All questions are compulsory. Each question carries 02 marks.
3. Section B comprises 8 long answer type questions out of which students must attempt any 5. Each question carries 10 marks.
4. Do not write anything on the question paper.

Q.No.	SECTION -A (SHORT ANSWER TYPE QUESTIONS)	Marks
1.	a. Differentiate between DFA and N DFA.	(2)
	b. Explain some properties and limitations of FSM.	(2)
	c. What is Pumping Lemma? Illustrate some applications of pumping lemma.	(2)
	d. What do you mean by ambiguity in regular grammar? Give an example of ambiguous regular grammar.	(2)
	e. Define Pushdown Machines. List some applications of it.	(2)
	f. How Deterministic TM is different from Non-Deterministic TM?	(2)
	g. State rules to convert CFG to CNF.	(2)
	h. What do you mean by closure properties of regular sets? Discuss any two closure properties of regular languages.	(2)
	i. Explain the design of TM and halting problem in TM.	(2)
	j. Differentiate between NFA with $\epsilon$ moves and NFA without $\epsilon$ moves.	(2)
	<b>SECTION -B (LONG ANSWER TYPE QUESTIONS)</b>	

2. Define Minimization of Finite Automaton. Construct a minimum state finite automaton equivalent to the finite automaton given in figure 1. (10)

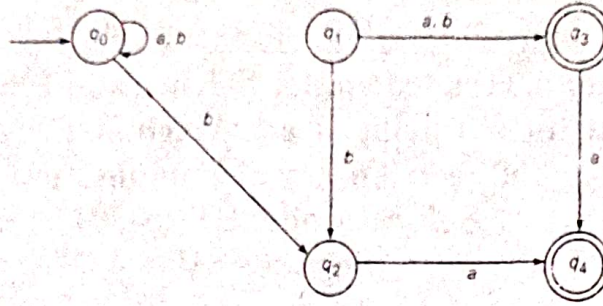
**Fig.1**



3. Construct a DFA equivalent to following N DFA in figure 2. (10)

**Fig. 2**





4. Sketch and describe the Chomsky Hierarchy of Grammar. (10)

5. What is primitive recursive function? Describe that factorial function is primitive recursive. (10)

? 6. (a) Differentiate between Melay and Moore Machines. (10)  
 (b) Construct pushdown automata for  $A = \{ w \in \{0, 1\}^* \mid w \text{ contains at least three } 1s \}$ .

? 7. Describe the processing for strings 011, 0011, 001 for the Turing machine given in table 1. (10)

Present state	Tape symbol				
	0	1	x	y	b
$\rightarrow q_1$	$xRq_2$				$bRq_5$
$q_2$	$0Rq_2$	$yLq_3$		$yRq_2$	
$q_3$	$0Lq_4$		$xRq_5$	$yLq_3$	
$q_4$	$0Lq_4$		$xRq_1$		
$q_5$				$yxRq_5$	$bRq_5$
$q_6$					

Table 1.

8. Remove the null production from the following grammar. (10)

$S \rightarrow ABAC$

$A \rightarrow aA \mid \epsilon$

$B \rightarrow bB \mid \epsilon$

$C \rightarrow c$

9. Show that the set of all strings over  $\{a, b\}$  consisting of equal number of a's and b's is accepted by a deterministic PDA. (10)

==END OF PAPER==