

M. SC. (Computer Science) SEM – I (Choice Based Credit & Grade System) : WINTER - 2018

SUBJECT : ELECTIVE – I : b) THEORY OF AUTOMATA

Day : Tuesday
Date : 16/10/2018

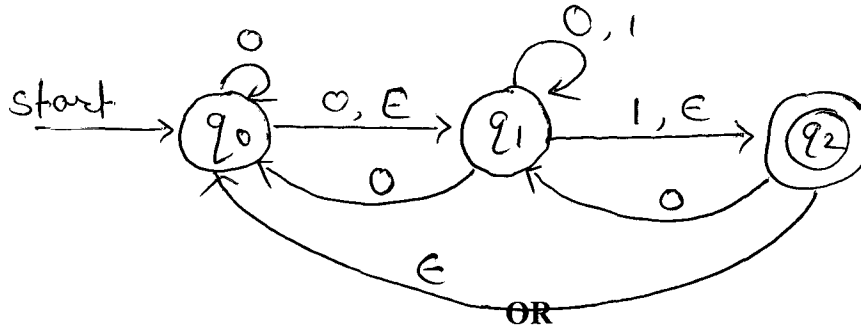
W-2018-1044

Time : 03.00 PM TO 06.00 PM
Max. Marks : 60

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.

Q.1 Define NFA with ϵ - closure. Construct DFA equivalent to the following [15]
NFA.



- a) Define Push Down Automata. Differentiate between NPDA and DPDA. [08]
- b) Show the equivalence of PDA and CFL with an example. [07]

Q.2 A) Attempt **ANY ONE** of the following: [08]

- i) Construct a grammar in Greibach Normal Form (GNF) equivalent to grammar
 $S \rightarrow AA \mid a$
 $A \rightarrow SS \mid b$
- ii) Define Moore Machine. Construct Moore Machine for the binary input sequence such that if it has a substring 101, the machine outputs 'A', if it has substring 110 then outputs 'B', else outputs 'C'.

B) Attempt **ANY ONE** of the following: [07]

- i) Construct the DFA equivalent to NFA $M = (\{q_0, q_1\}, \{0, 1\}, \delta, q_0, \{q_1\})$ where δ is as follows:

δ	0	1
q_0	$\{q_0, q_1\}$	$\{q_1\}$
q_1	ϕ	$\{q_0, q_1\}$

- ii) Construct the FA for the regular expression $(a^* + b^*)^* + ab$

Q.3 Attempt **ANY THREE** of the following: [15]

- a) Construct Turing Machine for the language $L = \{a^n b^n c^n \mid n \geq 1\}$
- b) Prove that regular sets are closed under complementation with an example.
- c) Compare PDA and FA.
- d) Define: i) Ambiguous grammar ii) prefix of a string
 iii) Leftmost derivation iv) Parse tree
- e) Eliminate ϵ - productions from G, where G is $S \rightarrow aSa \mid bSb \mid \epsilon$

Q.4 Write short notes on **ANY THREE** of the following: [15]

- a) Context Free Grammar
- b) Recursive enumerable sets
- c) Regular expression
- d) Operations on sets
- e) Lexical Analyzer

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