B.Tech. SEM -V (Computer) 2014 Course (CBCS) : SUMMER - 2019
SUBJECT-FORMAL LANGUAGES AND AUTOMATA THEORY

Day: Thursday
Date: 09/05/2019

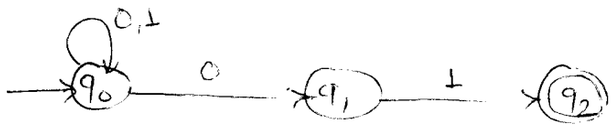
S-2019-2654

Time: 10.00 AM TO 01.00 PM
Max Marks: 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Assume suitable data if necessary.

Q.1 **a)** Explain the steps in conversion of NFA to DFA. Convert the following NFA to DFA. **(05)**



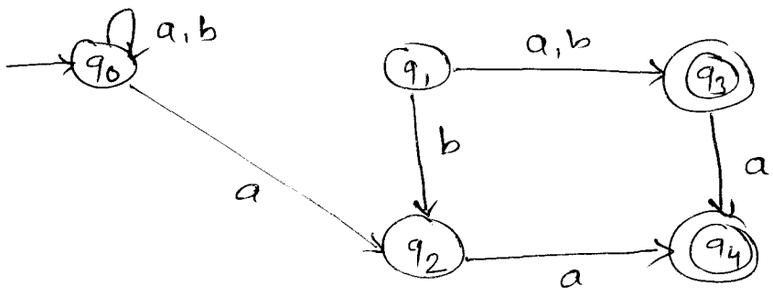
b) Give the Deterministic finite automata accepting the following language over the alphabet **(05)**

i) Number of 1's is multiple of 3
ii) Number of 1's is not multiple of 3

OR

Q.1 **a)** Define and describe NDFA with example **(05)**

b) Construct DFA equivalent to NDFA whose transition diagram is given below **(05)**



Q.2 **a)** Construct a Finite automata for the regular expression **(05)**
R= (0+1(01)*)*

b) Give Mealy and Moore machine for the following from input $\sum^*$ where $\sum$=(0,1,2) print the residue modulo 5 of the input treated as ternary (base 3). **(05)**

OR

Q.2 **a)** Construct a Mealy machine that accepts strings ending in '00' and '11'. Convert the same to Moore machine **(05)**

b) For each of the following draw DFA of the following regular expression: **(05)**
i) (11+00)* ii) (111+100)*0

Q.3 **a)** In each case show that the grammar is ambiguous and find the equivalent un ambiguous grammar **(05)**
i) S⟶SS| a|b ii) S⟶ABA , A⟶aA|Є, B ⟶bB| Є
iii) S⟶aSb| aaSb| Є

b) Convert the grammar below to its equivalent CNF **(05)**
S⟶PQP, P ⟶0P| Є, Q ⟶1Q| Є

OR

Q.3 Simplify and convert the following CFG to Chomsky Normal Form **(10)**
S⟶ AACD, A⟶ aAb| Є, C⟶aC |a, D⟶ aDa|bDb| Є

P.T.O.

Q.4 **a)** Construct PDA equivalent to the following CFG **(05)**
$S \rightarrow 0BB$, $B \rightarrow 0S|1S|0$
Test whether 010^4 is in the language

b) Give formal definition on PDA and comment on "whether DPDA is powerful than NPDA" if Yes Why? **(05)**

OR

Q.4 **a)** Construct PDA for the language **(05)**
$L= \{a^n, b^n, c^m, d^m | n,m \geq 1\}$ by empty stack

b) Explain properties of context free language **(05)**

Q.5 **a)** Explain in detail concept of universal Turing machine and extension to the basic Turing machine **(05)**

b) Design turing machine for following language **(05)**
$L= \{x|x \in X(a,b)^*\}$ having string equal number of a's and equal number of b's.

OR

Q.5 **a)** Prove the theorem "A language is recursive if and only if both it and its component are recursively enumerable". **(05)**

b) Design Turing machine to substract two unary numbers need not be retain. **(05)**

Q.6 **a)** Compare NFA, DFA, DPDA, NPDA, TM with reference to types of grammars and their applications respectively **(06)**

b) Explain natural language processing. **(04)**

OR

Q.6 **a)** Write short notes on: **(06)**
i) Syntax analysis language
ii) Searching methods using RE.

b) Explain how Turing machine can be considered as computer of integral function **(04)**

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