Total No. of Questions—4] [Total No. of Printed Pages—4

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T.Y. B.Sc. (III Sem.) EXAMINATION, 2016

COMPUTER SCIENCE

Paper II

CS-332 : Theoretical Computer Science

(2013 PATTERN)

Time : Two Hours **Maximum Marks : 40**

N.B. :— (*i*) Neat diagrams must be drawn wherever necessary.

(*ii*) Figures to the right indicate full marks.

(*iii*) *All* questions carry equal marks.

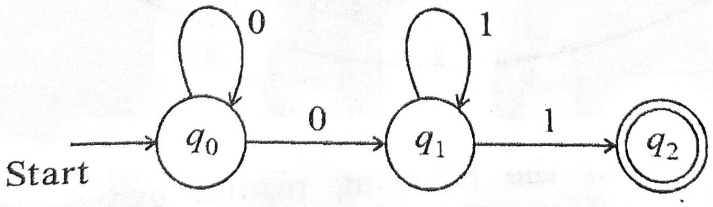
(*iv*) *All* questions are compulsory.

1. Attempt *all* of the following : [10×1=10]

(*a*) What are the proper prefixes and proper suffixes of the string "India" ?

(*b*) Define left linear and right linear grammar.

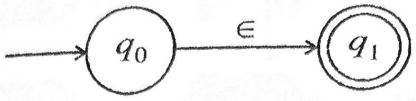
(*c*) Write the regular expression for the following FA :



(*d*) Compare 'λ' function of Melay and Moore machine.

P.T.O.

(e) Write down the '∈-closure' of each state from the following FA :



(f) State the two different ways to simplify the CFG.

(g) State the machines used for context free grammar and context-sensitive grammar.

(h) Differentiate between PDA and FA.

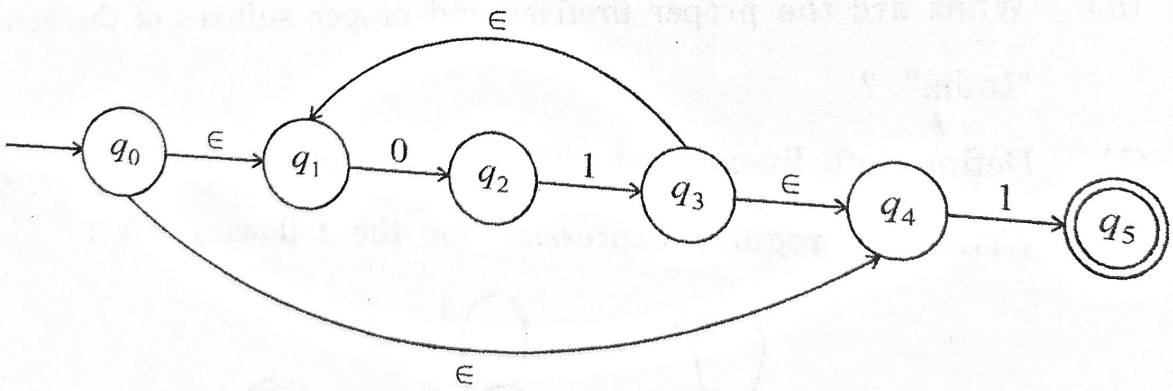
(i) Define tuples of LBA.

(j) State pumping lemma of regular set.

2. Attempt any *two* of the following : [2×5=10]

(a) Construct a DFA to accept all decimal numbers divisible by 3.

(b) Construct DFA equivalent to the following NFA :



(c) Construct FA for the following regular expression :

$(010 + 00)^* (10)^*$.

3. Attempt any *two* of the following : [2×5=10]

(*a*) Define PDA and construct PDA for L = $\{a^n b^m a^n \mid m, n \geq 1\}$.

(*b*) Construct the following CFG into Chomsky Normal Form (CNF) :

$S \rightarrow ABA$

$A \rightarrow aA \mid \in$ (epsilon)

$B \rightarrow bB \mid \in$ (epsilon)

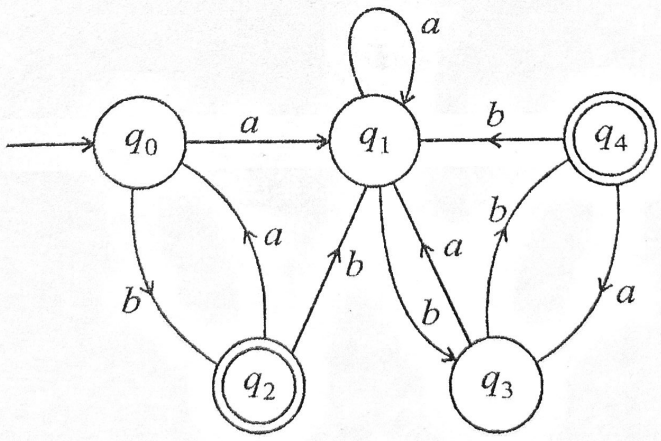
(*c*) Construct CFG for the following :

(*i*) $L = \{a^x b^y c^{x+y} \mid x, y \geq 1\}$

(*ii*) A language containing string having at least one occurrence of '00' over {0, 1}.

4. Attempt (A) *or* (B) :

(A) (*a*) Minimize the following DFA : [4]



(*b*) Explain the types of Turing Machine (TM). [4]

(*c*) Explain any *one* closure property of regular set. [2]

Or

(B) (*a*) Construct TM for $L = \{ww^R | w \in (0 + 1)^*\}$. [4]

(*b*) Convert the following CFG into PDA : [4]

$$S \rightarrow 1S | 1S0S | 1$$

Also show that the string "11101" is accepted by the PDA.

(*c*) Define the terms : [2]

(*i*) Ambiguous grammar

(*ii*) Parse tree.