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

Seat No.	

[5216]-302

T.Y. B.Sc. (Computer Science) (III Sem.) EXAMINATION, 2017

COMPUTER SCIENCE

Paper II

CS-332 : Theoretical Computer Science

(2013 PATTERN)

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

N.B. :— (*i*) *All* questions are compulsory.

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

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

1. Attempt *all* : [10×1=10]

(*a*) Write regular expression for the set of all strings of *a*'s and *b*'s ending with *ab* over $\Sigma = \{a, b\}$

(*b*) Define suffix of a string. Give *one* example.

(*c*) "DFA cannot have more than one final states." Justify.

(*d*) Write output function λ of Moore and Mealy machines.

(*e*) Write any *two* closure properties of regular expression.

(*f*) Define ambiguous grammar.

(*g*) Name the type of languages accepted by Pushdown Automata.

(*h*) Define non-deterministic Turing Machine.

P.T.O.

(*i*) What is unit production ?

(*j*) Consider the following grammar :

$S \rightarrow ADa$

$A \rightarrow a$

$D \rightarrow d$

The grammar is in CNF. Justify.

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

(*a*) Convert the following grammar in GNF :

$S \rightarrow aAS \mid a$

$A \rightarrow SbA \mid SS \mid bA$

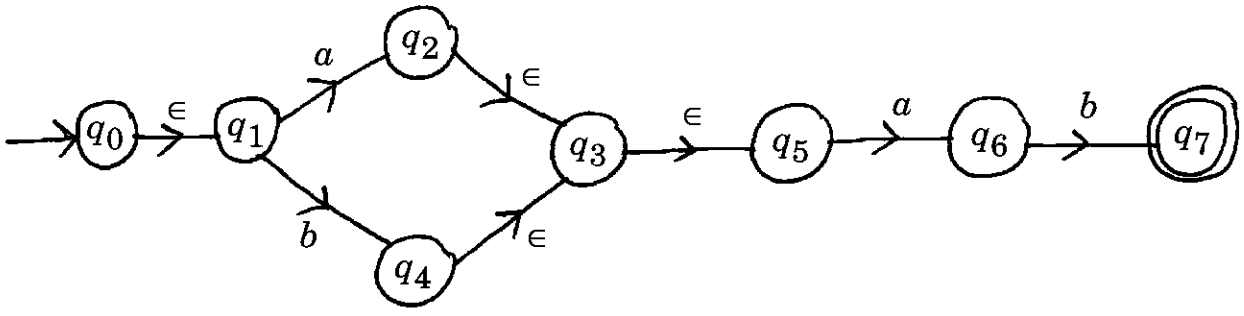
(*b*) Construct DFA to accept substrings having both *aa* and *bb* over $\Sigma = \{a, b\}$.

(*c*) Construct PDA for language :

$$L = \{a^m b^n \mid m > n \geq 1\}$$

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

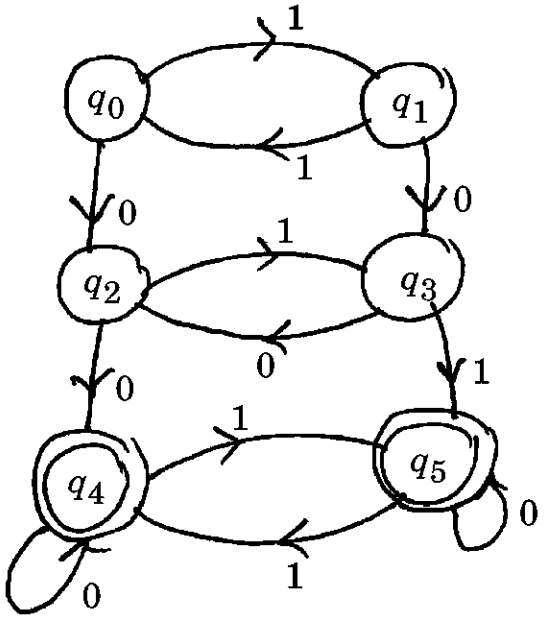
(*a*) Convert the following NFA to DFA :



(*b*) Construct Turing Machine for language :

$$L = \{a^n b^n a^n \mid n \geq 1\}$$

(*c*) Minimize the following DFA using Myhill-Nerode theorem :



4. (*a*) Construct Moore and Mealy machines which outputs valid for valid strings and invalid for invalid strings for language $L = a(a + b)^* b$. [4]

(*b*) Construct NFA for regular expression $1.0^* + 0^*.1$. [3]

(*c*) How to apply pumping lemma to prove certain languages are non-regular ? [3]

Or

(*a*) Construct CFG for the language $L = L_1L_2$ where : [4]

$L_1 = \{a^n\ b \mid n \geq 0\}$

$L_2 = \{b^m\ c \mid m \geq 0\}$.

(*b*) Write a short note on Chomsky's hierarchy. [4]

(*c*) Consider the following grammar :

$S \rightarrow AB \mid aD \mid a$

$A \rightarrow a$

$D \rightarrow aD \mid aDD$

Remove useless symbols and rewrite the grammar. [2]