PG/IIIS/MCA-302/19

MCA 3rd Semester Examination, 2019

MCA

(*Theory of Formal Languages and Automata*)

PAPER –MCA-302

Full Marks : 100

Time : 3 hours

Answer any **five** questions

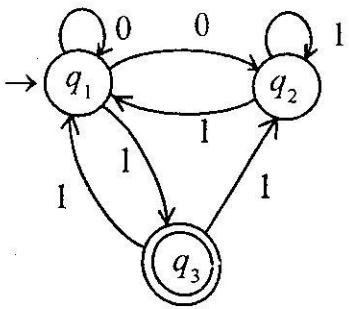
The figures in the right-hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

1. (*a*) Define a finite automation with a suitable example.

(*b*) Find the deterministic finite automation equivalent to :



(*c*) How a Mealy machine is different than a Moore machine ?

(*d*) Construct a DFA which accepts all strings over $\{a, b\}$ which do not end with b.

$3 + 5 + 2 + 4$

2. (*a*) Define grammar. Classify grammars according to chomsky with suitable example.

(*b*) Construct a grammar accepting

$$L = \left\{ a^n b^m c^m d^n \mid m, n \geq 1 \right\}.$$

(*c*) What do you mean by recursively enumerable language ?

$(2 + 4) + 6 + 2$

3. (*a*) State and prove Arden's theorem for regular expressions.

(*Continued*)

(*b*) Construct a finite automaton for the regular expression $(a + b)^* ab^* b$.

(*c*) Construct a transition system corresponding to the following grammar :

$$S \rightarrow aA$$
$$A \rightarrow a \mid bA \mid bS$$

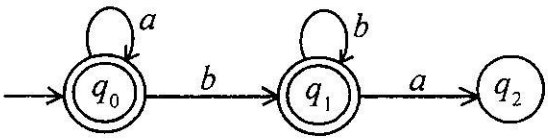
(2 + 4) + 4 + 4

4. (*a*) Prove that

$$L = \left\{ ww \mid w \in \{a, b\}^* \right\}$$

is not regular.

(*b*) Find the regular expression corresponding to the following FA :



7 + 7

5. (*a*) Define ambiguous grammar. Prove that the grammar

$$\{S \rightarrow SbS \mid a\}$$

is ambiguous.

(*b*) Reduce the following grammar :

$S \rightarrow AB \mid CA$
$B \rightarrow BC \mid AB$
$A \rightarrow a$
$C \rightarrow aB \mid b$
$E \rightarrow d$

(*c*) Eliminate the unit production from the grammar :

$S \rightarrow AB$
$A \rightarrow a$
$B \rightarrow C$
$C \rightarrow D$
$D \rightarrow d$ $(2 + 2) + 7 + 3$

6. (*a*) Find a grammar in CNF equivalent to the grammar :

$S \rightarrow ab\ Sb \mid a \mid aAb$
$A \rightarrow bS \mid aAAb.$

(*b*) Reduce the following grammar to Greibach normal form :

$S \rightarrow AA \mid a$
$A \rightarrow SS \mid b$ $7 + 7$

7. (*a*) Define PDA. Briefly describe the working mechanism of a PDA.

(*b*) Construct a PDA which accepts

$$L = \left\{ wcw^T \mid w \in \{a, b\}^* \right\}$$

(*c*) What do you mean by top-down and bottom-up parsing ?

(2 + 2) + 7 + 3

8. (*a*) Construct a Turing machine that accepts the strings over {0, 1} containing even no of 1's.

(*b*) Design a Turing machine over {1, *b*} which can compute concatenation function over $\Sigma = \{1\}$.

7 + 7

[*Internal Assessment* : 30 Marks]