MASTER OF COMPUTER APPLICATIONS (C.B.C.S.)
M.C.A. SEM-V : WINTER : 2021
SUBJECT: FINITE AUTOMATA & GRAMMARS

Day : Tuesday
Date : 18-01-2022 **W-11843-2021**
Time : 10:00 AM-01:00 PM
Max. Marks: 100

N.B.:

1) Attempt **ANY FOUR** questions from Section – I and attempt **ANY TWO** questions from Section – II.
2) Answers to both the sections should be written in **SEPARATE** answer books.
3) Figures to the right indicate **FULL** marks.

SECTION – I

Q.1 a) Construct DFA for language defined over alphabet {a, b, c} contains all strings ending with "ab" or "bc". **[07]**

b) For the following grammar, where S is the start symbol, derive following strings using Left Most derivation and Right Most derivation. **[08]**

$S \rightarrow 1A \mid 0B$
$A \rightarrow 0 \mid 0S \mid 1AA$
$B \rightarrow 1S \mid 0BB \mid 1$
Strings are : **i)** 110100 **ii)** 01100011

Q.2 Explain equivalence of PDA to CFG for the PDA define equivalent CFG where PDA is defined as $M = (\{q_0, q_1\}, \{a, b\}, \{B, R\}, \delta, q_0, R, \phi)$. Transition functions for PDA are given as: **[15]**

$\delta(q_0, a, R) = (q_0, BR)$
$\delta(q_0, a, B) = (q_0, BB)$
$\delta(q_0, b, B) = (q_1, \in)$
$\delta(q_1, b, B) = (q_1, \in)$
$\delta(q_0, \in, R) = (q_1, \in)$

Q.3 a) For given Melay Machine construct equivalent Moore Machine. **[07]**

	Transitions		**Output**	
δ	**a**	**b**	**a**	**b**
q_0	q_0	q_1	1	0
q_1	q_3	q_3	1	1
q_2	q_1	q_2	1	1
q_3	q_2	q_0	0	1

b) For given Moore machine construct equivalent Melay Machine. **[08]**

	Transitions		**Output**
δ	**0**	**1**	
q_0	q_1	q_2	A
q_1	q_2	q_3	A
q_2	q_3	q_4	B
q_3	q_4	q_4	A
q_4	q_0	q_0	B

Q.4 a) Using derivation tree show that the grammar is ambiguous **[07]**

$S \rightarrow 01S1 \mid 0A1 \mid 0$
$A \rightarrow 0AA1 \mid 1S$

P.T.O.

b) Explain algorithm to eliminate useless symbols from grammar from following production remove useless symbols from grammar. **[08]**

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

Q.5 Write notes on **ANY TWO** of the following: **[15]**

a) Normal form of Grammar
b) DPDA and NPDA
c) Myhill Nerode algorithm for minimization of DFA
d) Pumping Lemma for Regular Languages

SECTION – II

Q.6 Construct Turing Machine for language defined as **[20]**
$L = \{ 0^i 1 2^{i+2} \mid i >= 0\}$

Q.7 **a)** Minimize following DFA: **[10]**

δ	0	1
q_0	q_1	q_5
q_1	q_6	q_2
q_2^*	q_0	q_2
q_3	q_2	q_6
q_4	q_5	q_7
q_5	q_2	q_6
q_6	q_6	q_4
q_7	q_6	q_2

b) Explain steps for defining equivalent Grammar in GNF. **[10]**

Q.8 Design PDA to for language defined as **[20]**
$L = \{a^n b^n \mid n > 0\}$

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