Total No. of Questions : 12]

SEAT No. :

P2460

[Total No. of Pages : 4

[5153]-94

T.E. (Information Technology)

THEORY OF COMPUTATION

(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) ***Answer to the two Sections should be written in separate answer-books.***
2) ***Answer any three questions from each Section.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Assume suitable data, if necessary.***

SECTION - I

Q1) a) Design a FSM to check given decimal number is divisible by 4 or not. **[8]**

b) Prove that: **[8]**

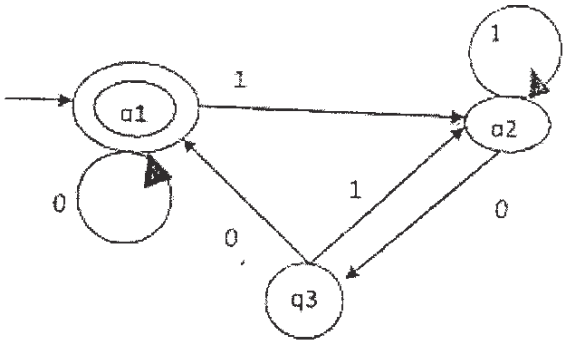
i) $(111^*)^* = (11 + 111)^*$

ii) $(0^*1^*)^* = (0 + 1)^*$

OR

Q2) a) Construct FSM for Binary Adder. **[6]**

b) Convert following DFA to RE. **[6]**



c) Define following terms with example: **[4]**

i) Kleen Closure.

ii) Regular expression.

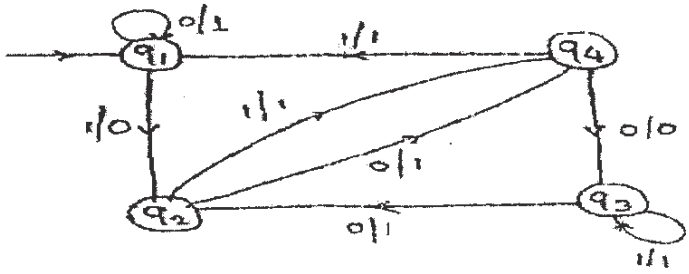
P.T.O.

Q3) a) Construct NFA for given RE (a + b)* (aa + bb) and find equivalent DFA. **[8]**

b) Construct Moore and convert it to Mealy Machine for 2's complement of any binary number. **[8]**

OR

Q4) a) Convert following Mealy Machine to its equivalent Moore Machine. **[8]**



b) Convert following NFA to its equivalent DFA. **[8]**

	0	1
→P	Q, S	Q
Q	R	Q, R
R	S	P
*S	---	P

Q5) a) Find CNF for the given CFG: **[8]**

$S \rightarrow PQP$

$P \rightarrow 0\ P | \in$

$Q \rightarrow 1\ Q | \in$

b) Prove that the following grammar is ambiguous and obtain unambiguous grammar. Consider W = ibtibtaea. **[10]**

$S \rightarrow iCtS$

$S \rightarrow iCtSeS$

$C \rightarrow b$

$S \rightarrow a$

OR

Q6) a) Construct CFG for **[8]**

i) All binary strings with eaul no. of a's and b's.

ii) All binary strings with no. of a's are even.

b) Simplify the following Grammar: **[10]**

$S \rightarrow Aa|bS$

$A \rightarrow aA|bB$

$B \rightarrow aA|bc$

$C \rightarrow aC|bc$

SECTION - II

Q7) a) State and explain Pumping Lemma for CFLs. **[6]**

b) Prove that if L_1 and L_2 are context-free languages over an alphabet then: **[10]**

L_1 Union L_2,

L_1 Concatenated with L_2

and L* are also CFLs.

OR

Q8) a) Convert the following right linear grammar to left linear grammar: **[8]**

$S \rightarrow 0A|1B$

$A \rightarrow 0C|1A|0$

$B \rightarrow 1B|1A|1$

$C \rightarrow 0|0A$

b) Construct FA for the following grammar: **[8]**

$S \rightarrow Ab|ab$

$A \rightarrow Ab|Bb$

$B \rightarrow aB|a$

Q9) a) Design a PDA to accepts the language: **[8]**

$L = \{a^n b^n \mid n >= 0\}$

b) Construct a PDA that accepts the language generated by the following grammar: **[8]**

$S \rightarrow aA$

$A \rightarrow aABc|bB|a$

$B \rightarrow b$

$C \rightarrow c$

OR

Q10)a) Construct the PM that accepts the language: **[8]**

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

b) Construct the PDA that accepts the language: **[8]**

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

Q11)a) Construct TM to calculate a – b where b > 0 and a, b both are Unary Numbers. **[10]**

b) Construct TM to replace 110 by 001 in any input binary strings. **[8]**

OR

Q12)a) Write short notes on: **[10]**

i) Multi Tape TM

ii) Universal TM

b) Construct TM for Multiplication of two unary numbers. **[8]**