Total No. of Questions : 12]

SEAT No. :

P1418

[Total No. of Pages : 4

[4858] - 185

T.E. (Computer Engg.)

THEORY OF COMPUTATION

(2008 Pattern) (Semester - I)

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

Instructions to the candidates :

1) ***Answer question 1 or 2, 3 or 4 and 5 or 6 from Section - I and question 7 or 8, 9 or 10 and 11 or 12 from Section - II.***
2) ***Answers to the two sections should be written in separate answer books.***
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) Define the following terms. **[6]**

i) Kleen Closure

ii) Finite Autimata

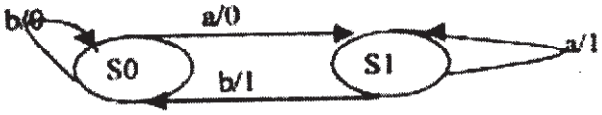
iii) Transition Diagram

b) Design DFA for a language of string 0 & 1 that **[6]**

i) Ending with 11

ii) Either begin or end with 01

c) Convert the following Mealy Machine to Moore Machine. Show the output for input string 'abba' through Moore machine. **[4]**



OR

P.T.O.

Q2) a) Convert DFA to NFA. **[8]**

	0	1
p	{p,q}	{p}
q	{r}	{r}
r	{s}	φ
s*	{s}	{s}

b) Design a Moore Machine that gives an output of 1 if the input string ends in 'bab'. Convert the same Moore Machine to Mealy Machine. **[8]**

Q3) a) Show ((a+bb)*aa)* and ε+(a+bb)*aa are equivalent. **[4]**

b) Prove that(1+00*1)+(1+00*1)(0+10*1)*(0+10*1)=0*1(0+10*1)* **[4]**

c) Convert following Regular Expression to DFA (Regular Expression to NFA with ε moves and direct method to convert NFA with ε to DFA) **[8]**

R.E.=01[(10*+111)*+0]*1

OR

Q4) a) Show for regular expression (rs+r)*r=r(sr+r)* **[4]**

b) Draw DFA of following Regular Expression. **[6]**

i) (11+00)*

ii) (111+100)*0

c) Using pumping lemma show that the language L={$a^m b^n$ |m>n} is not regular. **[6]**

Q5) a) For the grammar given below. **[6]**

E→E+T|T

T→T*F|F

F→(E) | a|b

Give derivation of (a+b)* a+b using sentential form and parse tree

b) Give context free grammar for following. **[6]**

i) (011+1)*(01)*

ii) $0^i 1^{i+k} 0^k$ where i, k > = 0

c) Simplify the following grammar **[6]**

S→ASB | ε

A→aAS | a

B→SbS | A |bb

OR

Q6) a) Construct the right linear grammar corresponding to the regular expression. **[6]**

R=(0+1)1*(1+(01)*)

b) Discuss the following applications of CFG. **[6]**

i) Parser

ii) Markup Languages

c) Convert the grammar given below to its equivalent CNF. **[6]**

$S \rightarrow PQP$

$P \rightarrow 0P \mid \varepsilon$

$Q \rightarrow 1Q \mid \varepsilon$

SECTION - II

Q7) a) Construct a PDA equivalent to the following. **[8]**

CFG G.

$S \rightarrow OBB$

$B \rightarrow OS \mid 1S \mid 0$

Test whether $.010^4$ is in N(A).

b) Define acceptance by PDA. **[4]**

i) By final state

ii) By empty stack

c) Construct pushdown automata $L = \{W \subset W^R \mid W \in (a + b)^*\}$ and W^R is reverse string of W. **[6]**

OR

Q8) a) Consider the PDA with following moves. Construct a CFG equivalent to PDA. **[8]**

$M = (\{q_0, q_1\}, \{a, b\}, \{P, Z_0\}, \delta, q_0, Z_0, \phi)$ and δ is given as :

$\delta(q_0, a, Z_0) = (q_0, PZ_0)$

$\delta(q_0, a, P) = (q_0, PP)$

$\delta(q_0, b, P) = (q_1, \varepsilon)$

$\delta(q_1, b, P) = (q_1, \varepsilon)$

$\delta(q_1, \varepsilon, P) = (q_1, \varepsilon)$

$\delta(q_1, \varepsilon, Z_0) = (q_1, \varepsilon)$

b) Compare deterministic PDA with non-deterministic PDA. **[4]**

c) Obtain a PDA to accept the language $L = \{a^n b^n \mid n \geq a\}$ by final state. **[6]**

Q9) a) Give the formal definition of post machine compare FA, PDA, PM and TM. **[8]**

b) Design a turing machine M to recognize the language $\{a^n b^n c^n \mid n \geq 1\}$ **[8]**

OR

Q10) a) Write short notes on : **[8]**

i) Universal Turing Machine.

ii) Composite Turing Machine.

iii) Iterated Turing Machine.

iv) Multitape Turing Machine.

b) Design a turing machine for finding.2's complement of a binary number. **[4]**

c) Construct a post machine for the language $L = \{0^n 1^n \mid n \geq 0\}$ **[4]**

Q11) a) Describe in detail Chomsky Hierarchy with example. **[8]**

b) Show that if L_1 & L_2 are recursively enumerable languages over Σ then $L_1 \cup L_2$ and $L_1 \cap L_2$ are also recursively enumerable. **[8]**

OR

Q12) a) Define the following terms : **[8]**

i) Post correspondence problem

ii) Un-decidability

iii) Context sensitive language

iv) Recursive & Recursively Enumerable language

b) What is Halting problem? Prove that halting problem is undecidable. **[8]**

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