Total No. of Questions :12]

SEAT No. :

P1667

[Total No. of Pages :5

[5058] - 155

T.E. (Computer Engg.)

THEORY OF COMPUTATION

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Attempt Q.1 or 2, Q.3 or 4, Q.5 or 6, Q.7 or 8, Q.9 or 10, Q.11 or 12.***
2) ***Answer to the two sections should be written is separate 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) Design a DFA accepting language. **[8]**

L = {w | w is of the form x01 y for some strings x and y consisting of 0's and 1's only}

b) Design a Mealy machine that accepts strings endings with '00' and '11'.**[8]**

c) Define following terms with example. **[2]**

i) Symbol

ii) Alphabet

OR

Q2) a) Define following terms with examples. **[8]**

i) DFA

ii) NFA

iii) Moore Machine

iv) Mealy Machine

b) Consider the following NFA with ∈ transitions. Convert this NFA to DFA. **[8]**

	∈	a	b	c
p	-	p	q	r
q	P	q	r	-
r	P	r	-	p

c) Prove that $(a + b)^* = (a + b)^* \cdot (a + b)^*$ **[2]**

Q3) a) Find Regular Expressions for the given sets: **[8]**

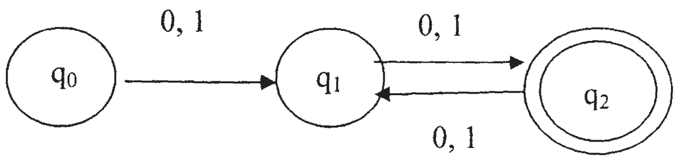
i) The set of all strings over {a, b} which end in ab.

ii) The set of all strings over {a, b} which start with ab and end with ba.

iii) The set of all strings over {0, 1} which contains 100 as substring.

iv) If L (r) = {a, c, ab, cb, abb, cbb, abbb,.......} what is r?

b) Consider the following transition diagram and convert it to its equivalent regular expression. **[8]**



OR

Q4) a) Construct a DFA for the given Regular Expression. **[8]**

$(11 + 0)^* (00 + 1)^*$

b) Write a short note on Applications of Regular Expressions. **[4]**

c) For the following regular expression, draw an FA recognizing the corresponding language. $r = (1 + 10)^*0$ **[4]**

Q5) a) Describe the language generated by grammars. **[8]**

i) $S \rightarrow aA/ bC/ b$

$A \rightarrow aS/ bB$

$B \rightarrow aC/ bA /a$

$C \rightarrow aB / bS$

ii) $S \rightarrow bS/ aA / \in$

$A \rightarrow aA/ bB /b$

$B \rightarrow bS$

b) What do you mean by ambiguous grammar? **[8]**

Let G be a grammar:

$S \rightarrow aB|bA$

$A \rightarrow a | aS|bAA$

$B \rightarrow b | bS|aBB$

For the string "aaabbabbba" find:

Leftmost and Rightmost derivations.

Also draw derivation trees.

OR

Q6) a) Find Right Linear Grammar for given Left Linear Grammar. **[8]**

$S \rightarrow B1 | A0|C0$

$A \rightarrow C0 | A1|B1|0$

$A \rightarrow B1|1$

$C \rightarrow A0$

b) Consider the grammar G with productions. Find an equivalent grammar in CNF. **[8]**

$S \rightarrow aB/bA$

$A \rightarrow a/aS/bAA$

$B \rightarrow b/bS/aBB$

SECTION - II

Q7) a) Define following: **[10]**

i) ID of PDA.

ii) PDA by empty stack.

iii) DPDA V/S NPDA.

iv) Two stack PDA with diagram.

v) PDA by final state.

b) Design a PDA to accept the language S + S * S. Simulate the working of above PDA for String. 4 + 4*4. **[8]**

OR

Q8) a) Design a PDA to check the well formedness of paranthesis. **[6]**

b) Construct PDA by null store for following grammar G. **[6]**

$S \rightarrow CS1/A$

$A \rightarrow 1AC/S/\varepsilon$

c) Give grammar for following PDA operations. **[6]**

$$\delta(q_0, o, Z) = (q_0, AZ)$$

$$\delta(q_0, 1, A) = (q_0, AA)$$

$$\delta(q_0, o, A) = (q_1, \varepsilon)$$

Q9) a) Design a TM to accept the string which ends in 'abb' where L(M) = $\{W \in \{a, b\}^* / W \text{ ends in abb}\}$. Simulate with example. **[8]**

b) Define following terms: **[8]**

i) Solvability.

ii) Semisolvability.

iii) Unsolvability.

iv) Formal difinition of T.M.

OR

Q10) a) Design a post machine for $L(M)=\{a^n b^{2n} / n >, 0\}$ **[4]**

b) Explain following: **[8]**

i) Programming techniques to TM.

ii) Extension to T.M.

c) Design a T.M. to accept the language $L(M)=\{a^n b^n / n \geq 1\}$ **[4]**

Q11) a) Write short note on following: **[8]**

i) Post correspondence problem.

ii) Universal Turing machine

b) State the following: **[8]**

i) Reduction with example.

ii) Totality problem with example.

OR

Q12) a) Write short note on following: **[8]**

i) Modified PCP problem.

ii) Recursive and recursively Enumerable language.

b) State the halting problem. Prove that halting problem of T.M. is undecidable with the help of example. **[8]**