Total No. of Questions : 12]

SEAT No. :

P2451

[Total No. of Pages : 3

[5153]-85

T.E. (Computer Engieneering)

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 section should be written in 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) Give the Mealy and Moore machine for the following processes. "For input from (0 + 1)*, if inputs ends in 101, output X; if input ends in 110, output Y, otherwise output Z". **[6]**

b) Let L be a language. It is clear from the definition that $L^+ \subseteq L^*$. Under what circumstances are they equal? **[6]**

c) Define the following terms with example: **[6]**

i) Symbol

ii) Alphabet

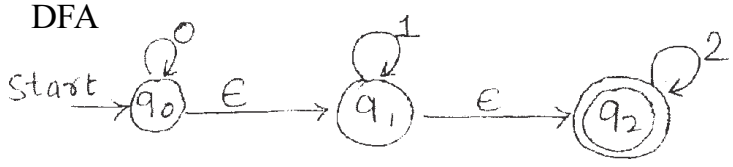
iii) DFA

OR

Q2) a) Consider the following NFA with ε - transitions. Convert this NFA to **[10]**

i) NFA without ε -moves

ii) DFA



b) Construct NFA and DFA for accepting all possible strings of zeroes and ones not containing 101 as a substring. **[6]**

c) Differentiate between NFA and DFA. **[2]**

P.T.O.

Q3) a) For the following regular expression, draw an FA recognizing the corresponding language. **[6]**

$r = (1 + 10)^*0$

b) Let L be any subset of 0^*. Prove that L^* is regular. **[6]**

c) Write a short note on Ardens theorem. **[4]**

OR

Q4) a) For each of the following draw DFA, **[8]**

i) $(11 + 00)^*$

ii) $(111 + 100)^*.0$

b) Explain the use of regular expressions in unix with any one example. **[4]**

c) Write short note on pumping lemma for regular expression **[4]**

Q5) a) In each case, find a CFG generating the given language: **[9]**

i) The set of odd length strings in {a, b}* with middle symbol a

ii) The set of even length strings in {a, b}* with the two middle symbosl equal

iii) The set of odd length strings in {a, b}* whose first, middle and last symbols are all same

b) Define Normal Forms with the help of example. **[4]**

c) Write a short note on Application of CFG. **[3]**

OR

Q6) a) Describe the language generated by each of these grammars. Justify your answer with an example. **[12]**

i) $S \rightarrow a\ S\ a\ |b\ S\ b|\varepsilon$

ii) $S \rightarrow a\ S\ a\ |b\ S\ b|\ a\ |\ b$

iii) $S \rightarrow a\ S\ b\ |b\ S\ a|\varepsilon$

b) For right linear grammar given below obtain an equivalent left linear grammar. **[4]**

$S \rightarrow 10A\ |\ 01$

$A \rightarrow 00A|1$

SECTION - II

Q7) a) Specify following with respect to Push Down Automata: **[8]**

i) Definition.

ii) Transition Function.

iii) Example.

b) Construct PDA equivalent to CFG of following productions: **[10]**

$S \rightarrow 0BB, \quad B \rightarrow 0S, \quad B \rightarrow 1S, \quad B \rightarrow 0$

OR

Q8) a) Construct a PDA accepting $\{a^n.b^n \mid n >= 1\}$ **[10]**

b) Explain how DPDA is different from NPDA with Example. **[8]**

Q9) a) Construct PDA accepts Language generated by the CFG. **[8]**

$S \rightarrow S + S$

$S \rightarrow S * S$

$S \rightarrow 4$

b) Define post machine. Compare FA, PDA, TM. **[8]**

OR

Q10)a) What is Post Correspondence Problem? Explain with Example. **[8]**

b) Construct Turing Machine for finding 2's Complement of a binary number. **[8]**

Q11)a) Construct Turing Machine for reversing a string. **[8]**

b) Write short note on: **[8]**

i) Halting Problem of Turing Machine

ii) Write short note on Universal Turing Machine

OR

Q12)a) Define Following Terms: **[8]**

i) Recursive Language

ii) Recursive Enumerable Language

b) Prove the theorem - "if L1 and L2 are recursively enumerable languages over Σ then $L1 \cup L2$ and $L1 \cap L2$ are also recursively enumerable". **[8]**