Total No. of Questions :12]

SEAT No. :

P2947

[Total No. of Pages :5

[4958] - 185

T.E. (Computer Engineering)

THEORY OF COMPUTATION

(2008 Course) (Semester - I) (310245)

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

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section - II***
2) ***Answers to the two sections should be written in separate books.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***

SECTION - I

Q1) a) Define following terms with example. **[4]**

i) Alphabet

ii) Languages

b) Draw DFA for following language. **[8]**

i) All string starting with abb

ii) All string ending with abb

c) Give Mealy and Moore machine for "For input from (0+1)*, if i/p ends in 101, output *x*, if i/p ends in 110. Output *y*, otherwise output *z*". **[6]**

OR

P.T.O.

Q2) a) Consider following ε - NFA **[10]**

	ε	a	b	c
$\rightarrow p$	{q, r}	ϕ	{q}	{r}
q	ϕ	{p}	{r}	{p, q}
r*	ϕ	ϕ	ϕ	ϕ

(r* = final state; p = initial state)

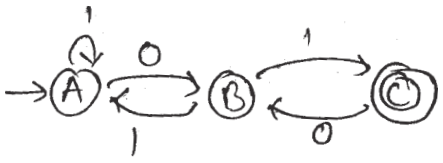
i) compute ε - closure of each state

ii) convert automata to DFA.

b) Define Mealy and Moore machine. Design Mealy machine which can output Even/odd if total no. of 1's in the i/p is even or odd. The i/p symbols are 0 and 1. **[8]**

Q3) a) Construct NFA with ε-moves for R.E. = 0.1 $[(10^*+111)^* + 0]^*1$. Convert it to DFA using direct method at conversion from NFA with ε-moves to DFA. **[8]**

b) Consider the following transition diagram, convert it to an equivalent regular expression using Arden's theorem. **[8]**



OR

Q4) a) Using pumping lemma of regular set prove the language. **[8]**

$L = \{ww \mid w \in \{0, 1\}^*\}$ is not regular.

b) Construct finite automata equivalent to following regular set **[8]**

i) $10 + (0 + 11)\ 0^*1$

ii) $01\ [((10)^* + 111)^* + 0]^*.1$

Q5) a) Give an ambiguous grammar at if -then- else statement and then rewrite equivalent unambiguous grammar. **[8]**

b) Convert following grammar to CNF **[4]**

$S \rightarrow Aba \quad S \rightarrow aab \quad B \rightarrow Ac$

c) Write short note on chomsky heirarchy. **[4]**

OR

Q6) a) Give context free grammar for following language. **[8]**

i) $(011\ +1)^*\ (0\ 1)^*$

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

b) For grammar given below **[6]**

$S \rightarrow A/B$
$A \rightarrow OA/\varepsilon$
$B \rightarrow OB/\ 1B/\varepsilon$

Give Parse tree for leftmost & right most derivation of string 1001.

c) Define context free grammar. **[2]**

SECTION - II

Q7) a) Construct push down automata for accepting $\{a^n b^m a^n \mid m,n >= 1\}$. **[8]**

b) Consider the PDA of following moves, Obtain its equivalent CFG. **[10]**

$(q0, a\ z0) = (q0, az0)$, $(q0, a, a) = (q0, aa)$, $(q0, b, a) = (q1, \varepsilon)$, $(q1, b, a) = (q1, \varepsilon)$, $(q1, \varepsilon, z0) = (q1, \varepsilon)$.

OR

Q8) a) Design push down automata for detection of palindromes over a, b. **[6]**

b) Write definition of DPDA and how it is different from NDPDA. **[4]**

c) Design push down automata for accepting the set of all strings over {a,b} with an equal number of a' s and b' s. The string should be accepted both by **[8]**

i) Final state

ii) Empty stack

Q9) a) Explain following Turing Machine. **[6]**

i) Single infinite length TM

ii) Multitape TM.

b) Construct TM for checking well formedness of parenthesis. **[6]**

c) Write a short note on universal TM. **[4]**

OR

Q10)a) Construct NDTM ot recognize words of the form ww over alphabet {a, b}.**[8]**

b) Design Post Machine which accepts the strings of a and b having odd length and the element at the center is 'a'. **[6]**

c) Define Turing Machine. **[2]**

Q11)a) Show that the set of languages L over {0, 1} so that neither L and L' is recursively enumerable nor is uncountable. **[6]**

b) Explain Chomsky hierarchy defined for languages and machines with neat diagram. **[8]**

c) What is undecidability? **[2]**

OR

Q12)a) Show that if L1 and L2 are recursive then **[6]**

$L1 \cup L2$ and $L1 \cap L2$ are also recursive.

b) Write a short note on POST correspondence problem. **[4]**

c) State the following: **[6]**

i) Solvability

ii) Semisolvability

iii) Unsolvability