Total No. of Questions : 12]

SEAT No. :

P1431

[Total No. of Pages : 3

[4858] - 205

T.E. (IT) (Semester - I)

THEORY OF COMPUTATION

(2008 Pattern)

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

Instructions to the candidates :-

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from the SECTION - I.***
2) ***Solve Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from the SECTION - II.***
3) ***Answers to the two sections should be written in separate answer books.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Assume suitable data if necessary.***

SECTION - I

Q1) a) Design FA/FSM that read strings made up of I = {a, b} and accept only those strings which starts with "a" and ends with "bb" **[8]**

b) Define and explain : **[8]**

i) Language

ii) Cartesian Product

iii) Regular Expression

iv) Kleene Closure

c) What is regular expression and explain with example. **[2]**

Q2) a) Design a Finite State Machine to accept set of strings containing substring "101" over input {0,1}. **[8]**

b) Give RE for following language over = {0, 1}. **[8]**

i) Language of all strings that begin with "11" and end with "01"

ii) Language of all strings in which occurrence of "a" is always tripled

iii) Language of all strings containing substring 00.

iv) Language of all strings not containing substring 00.

c) Show that (a*b*) = (a+b)* **[2]**

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Q3) a) Design a Mealy machine to compute 2's complement of a given binary number. **[8]**

b) Construct DFA for regular expression abb (a+b)* **[8]**

Q4) a) Convert the following NFA into equivalent DFA **[8]**

NFA = ({p, q, r, s}, {0, 1}, δ, p, {s})

	0	1
p	p,q	p
q	r	r
r	s	-
s	s	s

b) Construct NFA for the following regular expression. **[8]**

i) $a^*b(bb)^+$

ii) (a+b)*bab(a+b)*

Q5) a) Show that the following grammar is ambiguous **[6]**

S ->aSbS S ->bSaS S-> ε

b) Convert the following grammar to Chomsky Normal Form (CNF) **[6]**

G = ({S}, {a, b}, P, S)

S->ABA, A->aA, A-> ε, B->bB, B-> ε

c) Obtain a grammar to generate the language $L = \{a^{2n} b^n | n>0\}$ **[4]**

Q6) a) Explain Chomsky Hierarchy. **[6]**

b) Consider the following grammar **[6]**

S->aB, S->bA,

A->a,A->aS,A->bAA.

b-> b,B->bS,B->aBB

Derive the string aaabbb using

i) Leftmost derivation

ii) Rightmost derivation.

c) Construct CFG for language of even length palindrome of strings of a's and b's. **[4]**

SECTION - II

Q7) a) Show that CFLs are closed under Union, Concatenation and Kleene closure. **[6]**

b) Explain closure properties of regular languages. **[6]**

c) Let G = ({A0, A1},{a, b}, P, A0)
Where P = {A0->aAl, Al->bAl, Al->a, Al->bA0}
Convert given grammar to equivalent Left linear grammar **[6]**

Q8) a) State and prove Pumping lemma theorem for Context-Free Language. **[6]**

b) Let G = ({A, A}, {a, b}, P, A)
where P = {A->aB, B->bB | a | bA}
Construct a FA equivalent to G. **[6]**

c) Construct a regular grammar G generating the regular set represented by P = b* a(a+b)* **[6]**

Q9) a) Compare PDA with FSM and Construct PDA for S ->S + S, S->S * S, S->8 **[8]**

b) Define post machines and explain its elements. **[4]**

c) Define acceptance by PDA **[4]**

i) By final state

ii) By empty stack.

Q10) a) Show that post machine for l = {a^n b^n c^n} and compare PDA with PM **[8]**

b) Obtain a PDA to accept the language
L = {a^n b^n | n> 1} by a final state **[8]**

Q11) a) Write short notes on : **[8]**

i) Limitation of Turing Machine

ii) Halting Problem of Turing Machine

b) Design a Turing machine to compute 1's complement of a given binary number. **[8]**

Q12) a) Write a short note on universal Turing machine. **[8]**

b) Design a Turing machine for concatenation of two strings over input a, b. **[8]**

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