Sem V T.E. Comp. T.C.S. 02/06/06.

[REVISED COURSE]

CON/1869-06. TV-8307

(3 Hours) [Total Marks : 100

N.B. : (1) Question No.1 is compulsory.
(2) Attempt any four questions out of remaining six questions.
(3) Assumptions made should be clearly stated.
(4) Assume suitable data wherever required but justify the same.
(5) Figures to the right indicate full marks.

1.a) Design the finite state machine that compares two binary numbers to determine whether they are equal and which of the two is larger. (08)

b)(i)State and prove the pumping lemma for context free languages . (08)

(ii)Convert the following regular expression to NFA with ϵ transitions. (04)

$R = (1(00)^*1+01^*0)^*$

2.a) Prove the following :- (10)

(i) $L = \{ a^p \mid p \text{ is prime}\}$ is not context free.

(ii) $L = \{ (ab)^n a^k : n>k, k\geq 0 \}$ is not regular.

b) Consider the following grammar :- (10)

$S \rightarrow ASB \mid \epsilon$
$A \rightarrow aAS \mid a$
$B \rightarrow SbS \mid A \mid bb$

Put the above grammar in Chomsky normal form.

3. a) Give the DFA accepting the following language over alphabet {0,1} (08)
L = 'Set of all strings beginning with 1 that, when interpreted as a binary integer, is a multiple of 5.' for example, strings 101,1010, and 1111 in the language; 0, 100, and 111 not.

b) (i) Design turing machine that can accept the set of all even palindromes over alphabet {0,1} (08)

(ii) Show that that (04)

$(1+00^*1) + (1+00^*1)(0+10^*1)^* (0+10^*1) = 0^*1(0+10^*1)^*$

4. a) Construct the PDA equivalent to the following context free grammar. (10)

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

Test whether 010^4 is in language.

b)Prove that it is undecidable whether a context free grammar is ambiguous.(10)

5. a) Convert the following grammar into Grebaic normal form. (10)

$S \rightarrow XY1 \mid 0$
$X \rightarrow 00X \mid Y$
$Y \rightarrow 1X1$

b) Design turing machine to recognize the language $L = \{1^n2^n3^n \mid n\geq 1\}$ (10)

6. a) Design the PDA that will recognize the language $L = WW^R$: W is in $\{a,b\}^*$ i,e even length palindrome over $\sum = \{a,b\}$. (10)

b) Give the moore and mealy machine for the following (10)

For the input from $\sum^*$, where $\sum = \{0,1,2\}$,print the residu modulo 5 of the input treated as ternary.

7. a) Write regular expressions for the following languages (06)

i) $\sum = \{0,1\}$ containing all possible combinations of 0's and 1's but not having two consecutive 0's.

ii) The set of all strings of 0's and 1's such that every pair of adjacent 0's appears before any pair of adjacent 1's.

iii) The set of all strings over $\sum = \{0,1\}$ without length two.

b) i) Verify the following identities involving regular expressions. (06)

$(R+S)+T = R+(S+T)$

$(RS)T = R(ST)$

ii) Write short notes on any two (08)

(i) Grebaic Theorm.

(ii) Post correspondence problem.

(iii) Myhill-Nerode's Theorm.