May 2015

Total No. of Questions : 10]

SEAT No. :

P2429

[Total No. of Pages :4

[4758] - 600

T.E. (I.T.)

THEORY OF COMPUTATION

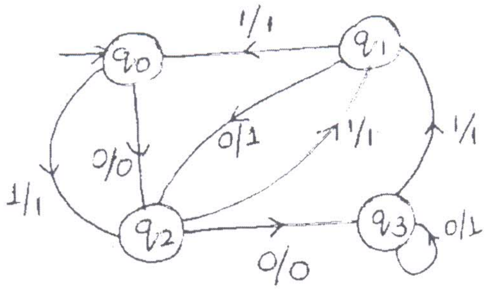
(2012 Course) (End- Sem.) (Semester - I) (314442)

Time : 2 ½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) *Neat diagrams must be drawn wherever necessary.*
2) *Figures to the right indicate full marks.*
3) *Assume suitable data, if necessary.*

Q1) a) Construct Moore machine equivalent for the given Mealy machine. **[6]**



b) Let $\Sigma = \{a,b\}$. Write RE to define language consisting of strings such that **[4]**

i) Strings without substring bb

ii) Strings that have exactly one double letter in them.

OR

Q2) a) Design a DFA for accepting L over {0,1} such that every substring of length 4 contains at least three 1's. **[4]**

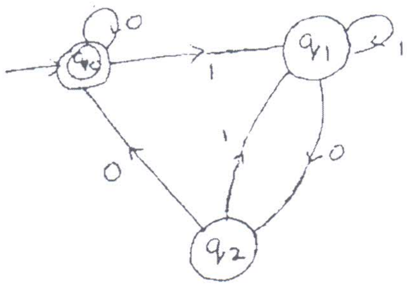
b) Define Finite Automata and justify why palindrome strings cannot be checked for by FSM. **[4]**

c) With examples define Regular Expression. **[2]**

P.T.O.

Q3) a) Construct NFA accepting language represented by 0*1*2* and convert it into DFA. **[6]**

b) Find RE for the following DFA using Arden's theorem. **[4]**



OR

Q4) a) Give the CFG for $\Sigma = \{a,b\}$. **[4]**

i) To generate strings in which no consecutive b's can occur but a's can be consecutive.

ii) Language is $\{a^x b^y$ /$x \neq y$ and $x,y > 0\}$.

b) Convert the given grammar into GNF: **[4]**

$S \rightarrow AB$

$A \rightarrow BS|b$

$B \rightarrow SA|a$

c) Write a note on applications of CFG. **[2]**

Q5) a) Construct a PDA to accept the language $\{a^n b^m c^{(n+m)}$ /where n,m >=1}. **[6]**

b) Construct PDA equivalent to the given CFG: **[8]**

S → OA1/OBA

A → S01/0

B → 1B/1

c) Compare PDA and FA. **[4]**

OR

Q6) a) Construct a post m/c to accept the language $\{a^n b^{n+1} / \text{where } n >= 1\}$. **[8]**

b) Construct a CFG equivalent to PDA

$M = (\{q_o, q_1\}, \{0,1\}, \{B,R\}, \{\delta, q_o, R, \phi\})$ where δ is **[8]**

$\delta(q_o, o, R) = (q_o, BR)$

$\delta(q_o, o, B) = (q_o, BB)$

$\delta(q_o, 1, B) = (q_1, B)$

$\delta(q_1, 1, B) = (q_1, B)$

$\delta(q_1, o, B) = (q_1, \varepsilon)$

$\delta(q_1, \wedge, R) = (q_1, \varepsilon)$

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

Q7) a) Design a TM that computes the function **[12]**

$f(x, y) = x + y$ if $x >= y$

$= 0$ if $x < y$ where x & y are unary.

Simulate the working of the TM for x = 2, y = 2.

b) Explain the diff. types of turing machines. **[4]**

OR

Q8) a) Define Turing Machine and construct a TM which recognizes strings consisting of equal no. of 0's and 1's. **[8]**

b) Compare FA, PDA and TM. **[4]**

c) Explain the halting problem of turing machines. **[4]**

Q9) a) Explain with example Turing Reducibility. **[6]**

b) Prove that the following decision problems are recursive. **[10]**

i) Two DFA' s are equivalent or Not.

ii) NFA accepts a word or not.

OR

Q10) a) Define and differentiate recursive languages and recursively enumerable languages. **[6]**

b) P.T. the following decision problems are recursive **[10]**

i) DFA accepts a word or not

ii) CFG G generates the string w or not.

☼ ☼ ☼