

Total No. of Questions : 10]

SEAT No. :

P2429

[4758] - 600

[Total No. of Pages :4

T.E. (I.T.)

THEORY OF COMPUTATION

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

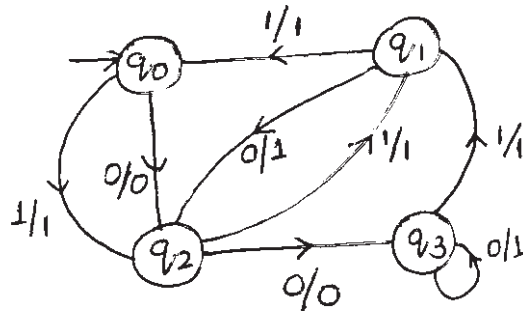
Time : 2 ½ Hours]

[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

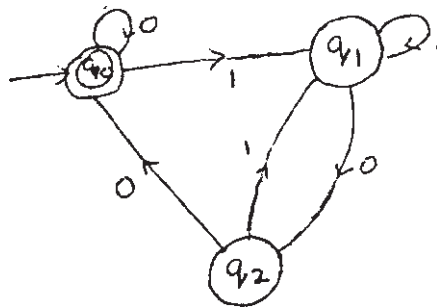
Q2) a) Design a DFA for accepting L over $\{0,1\}$ such that every substring of length 4 contains at least three 1's. [4]

- 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 $\{a^x b^y / x \neq y \text{ and } x, y > 0\}$.

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 $\{a^n b^m c^{(n+m)} / \text{where } n, m \geq 1\}$. [6]

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

$S \rightarrow OA1/OBA$

$A \rightarrow S01/0$

$B \rightarrow 1B/1$

c) Compare PDA and FA. [4]

OR

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

b) Construct a CFG equivalent to PDA

$M = (\{q_0, q_1\}, \{0, 1\}, \{B, R\}, \{\delta, q_0, R, \phi\})$ where δ is [8]

$$\delta(q_0, 0, R) = (q_0, BR)$$

$$\delta(q_0, 0, B) = (q_0, BB)$$

$$\delta(q_0, 1, B) = (q_1, B)$$

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

$$\delta(q_1, 0, B) = (q_1, \epsilon)$$

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

c) Define Post Machine. [2]

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

$$f(x, y) = x + y \quad \text{if } x \geq y$$
$$= 0 \quad \text{if } x < y \quad \text{where } x \text{ \& } y \text{ are unary.}$$

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.

