

[5058] - 405

T.E. (IT)

THEORY OF COMPUTATION

(2012 Pattern) (End Semester) (Semester - I)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

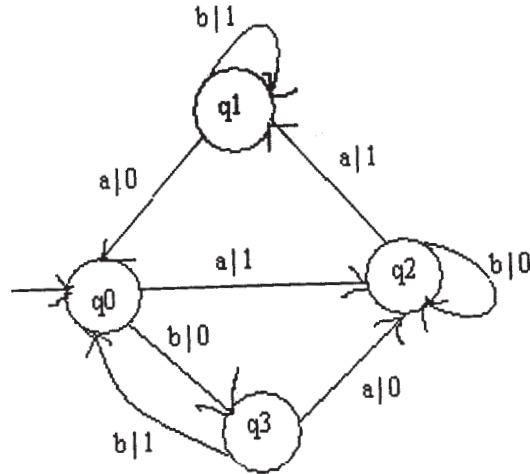
- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.

Q1) a) Construct a deterministic finite automata (DFA) for accepting L over (0, 1) such that every substring of length 4 contains at least three 1'S. [4]

b) Construct DFA for the R.E $10 + (0 + 11)$ [6]

OR

Q2) a) Construct Moore machine for given Mealy machine. [6]



b) State the pumping lemma theorem for regular sets. Show that the language $L = \{0^n \mid n \text{ is prime}\}$ is not regular. [4]

P.T.O.

Q3) a) Convert given CFG to GNF. [6]

$S \rightarrow AA|0$

$A \rightarrow SS|1$

b) Consider CFG with productions [4]

$S \rightarrow baXaS|ab$

$X \rightarrow Xab|aa$

If $w = baaaababaab$ then give rightmost derivation and leftmost derivation of w .

OR

Q4) a) Convert the following grammar to their equivalent CNF. [6]

$S \rightarrow 1A|0B$

$A \rightarrow 1AA|0S|0$

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

b) Convert Left Linear Grammar to equivalent Right linear Grammar. [4]

$S \rightarrow C0|A0|B1$

$A \rightarrow A1|C0|B1|0$

$B \rightarrow B1|1$

$C \rightarrow A0$

Q5) a) Define PDA [4]

i) Through final state

ii) Through empty stack

b) Design a PDA for the language $L = \{a^n b^m c^n \mid m, n \geq 1\}$ by empty stack. [8]

c) Construct PDA equivalent to the following CFG. [6]

$S \rightarrow 0A1|0BA$

$A \rightarrow S01|0$

$B \rightarrow 1B|1$

OR

- Q6)** a) Give CFG generating the language accepted by following PDA
 $M = (\{q_0, q_1\}, \{a, b\}, \{z_0, X\}, \delta, q_0, z_0, \emptyset)$, δ is given below [8]

$$\delta(q_0, b, z_0) = \{(q_0, Xz_0)\}$$

$$\delta(q_0, b, X) = \{(q_0, XX)\}$$

$$\delta(q_0, a, X) = \{(q_1, X)\}$$

$$\delta(q_0, \varepsilon, z_0) = \{(q_0, \varepsilon)\}$$

$$\delta(q_1, b, X) = \{(q_1, \varepsilon)\}$$

$$\delta(q_1, a, z_0) = \{(q_0, z_0)\}$$

- b) Design PM to for $L = \{a^n b^n c^n \mid n \geq 0\}$ Can you design NPDA for same? Justify. [6]
- c) Compare the power of Post machine and Push down Automata. [4]

- Q7)** a) Design a Turing Machine to add two unary numbers. [8]
- b) Explain Halting problem of TM. [4]
- c) Differentiate between FA, PDA and TM. [4]

OR

- Q8)** a) Construct TM to replace string 110 by 101 in binary input string. [8]
- b) Write short note on Universal Turing machine. [8]

- Q9)** a) Explain Post Correspondence Problem with example. [8]
- b) Explain recursive language and recursively enumerable language with suitable example. [8]

OR

- Q10)** a) Define decidability of problem with example. Describe undecidable problems for Context Free Grammar. [8]
- b) Write short note on [8]
- i) Multitape TM
- ii) Turing Reducibility.

