Total No. of Questions :10]

SEAT No. :

P1765

[Total No. of Pages :4

[5058] - 405

T.E. (IT)

THEORY OF COMPUTATION

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

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

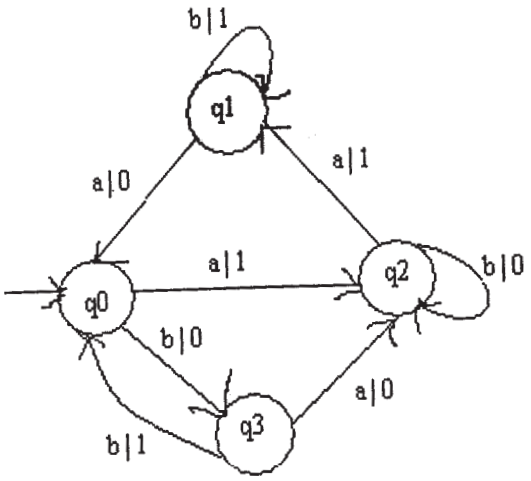
1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

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->AA|0

A-> SS|1

b) Consider CFG with productions **[4]**

S->baXaS|ab

X->Xab|aa

If w = baaaababaab then give rigtmost derivation and leftmost derivation of w.

OR

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

S->1A|0B

A->1AA|0S|0

B->0BB|1S|1

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

S->C0|A0|B1

A->A1|C0|B1|0

B->B1|1

C->A0

Q5) a) Define PDA **[4]**

i) Through final state

ii) Through empty stack

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

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

S->0A1|0BA

A->S01|0

B->1B|1

OR

Q6) a) Give CFG generating the language accepted by following PDA M = $(\{q0,q1\},\{a,b\},\{z0,\mathrm{X}\},\delta,\mathrm{q}0,\mathrm{z}0,\varnothing\}),\delta$ is given below **[8]**

$\delta(q0,b,z0)=\{(q0,\mathrm{X}\,z0)\}$

$\delta(q0,b,\mathrm{X})=\{(q0,\mathrm{XX})\}$

$\delta(q0,a,\mathrm{X})=\{(q1,\mathrm{X})\}$

$\delta(q0,\varepsilon,z0)=\{(q0,\varepsilon)\}$

$\delta(q1,\mathrm{b},\mathrm{X})=\{(q1,\varepsilon)\}$

$\delta(q1,a,z0)=\{(q0,z0)\}$

b) Design PM to for L = $\{a^n b^n c^n \mid n>=0\}$ 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.