Printed Pages : 4

EIT-072

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 113752

Roll No.

B. Tech.

(SEM. VII) (ODD SEM.) THEORY EXAMINATION, 2014-15

THEORY OF AUTOMATA & FORMAL LANGUAGES

Time : 3 Hours] [Total Marks : 100

Note : (1) Attempt **all** questions.

(2) Assume suitable notations whereever necessary.

1 Attempt any two parts of the following : 2×10=20

(a) If $M = \left(\{P, Q, R, S\}, \{0,1\}, \partial, P, \{Q.S\}\right)$ and the transition table is given as :

States / input	0	1
$-> P$	Q, S	Q
$Q+$	R	R, S
R	S	P
$S+$	–	P

Construct a DFA equivalent to the given NFA.

(b) Construct a Minimum state automation equivalent to the given DFA :

States / input	0	1
$-> q_0$	$q1$	$q2$
$q1$	$q4$	$q3$
$q2$	$q4$	$q3$
$q3+$	$q5$	$q6$
$q4+$	$q7$	$q6$
$q5$	$q3$	$q6$
$q6$	$q6$	$q6$
$q7$	$q4$	$q6$

(c) Construct a DFA accepting all the numbers over {0,1,.....,8,9} which are divisible by 3. Also verify your designed machine.

2 Attempt any **two** parts of the following : **2×10=20**

(a) (i) State and prove Arden's theorem.

(ii) Prove

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

(b) Construct a DFA with reduced states equivalent to the R.E. 10+((0+11)0*1).

(c) State and prove pumping lemma for regular set, also show that $L=\{a^p / p \text{ is a prime}\}$ is not regular.

3 Attempt any **two** parts of the following : **2×10=20**

(a) Describe both the lemmas used to convert a Context Free Grammar into Greibach Normal Form.

(b) Convert the given CFG into Chomsky Normal Form (CNF) :

$S \rightarrow AB / aB$

$A \rightarrow aab / \in$

$B \rightarrow bbA$

(c) Find the reduced grammar equivalent to the grammar G whose productions are :

$S \rightarrow AB / CA$

$B \rightarrow BC / AB$

$A \rightarrow a$

$C \rightarrow aB / b$

4 Attempt any **two** parts of the following : **2×10=20**

(a) Consider the language of all balanced strings involving two types of brackets : { } and [ ]. Construct the PDA for the above language.

(b) Construct the PDA for :

$\left\{WW^T / W \in (a+b)^*\right\}$.

(c) Consider the given

$PDA : M = \left(\{q0\}, \{0,1\}, \{a, b, Z0\}, \delta, q0, Z0, \phi\right)$

Where δ is defined as follows :

$$\delta(q_0, 0, Z_0) = \{(q_0, aZ_0)\}$$

$$\delta(q_0, 1, Z_0) = \{(q_0, bZ_0)\}$$

$$\delta(q_0, 1, b) = \{(q_0, bb)\}$$

$$\delta(q_0, \in, Z_0) = \{(q_0, \in)\}$$

Convert the given PDA M to corresponding CFG.

5 Attempt any **two** parts of the following : **2×10=20**

(a) Write post correspondence problem. Differentiate it with modified PCP. Does the PCP with two lists x=(1,10,1011) and y=(111,101,10101) have a solution. Explain.

(b) What is recursive and recursive enumerable languages ? Prove that L is recursive iff L and its complement L^1 are both Recursive Enumerable ?

(c) Design a Turing Machine for

$$L = \{a^i b^i / i >= 1\}.$$