53 (IT 503) THCP

2017

THEORY OF COMPUTATION

Paper : IT 503

Full Marks : 100

Time : Three hours

The figures in the margin indicate full marks for the questions.

Answer ***any five*** *questions.*

1. *(a)* Prove that $L = \{0^n 1^n \mid n \geq 1\}$ is not regular. 10

   (b) Define $\in$ closure of a state with example. Prove that $Q + RP = QP^*$. 10

2. *(a)* Write regular expressions for the following : 10

   (i) Binary members that are multiple of 2.

(ii) Strings of a's and b's with no consecutive a's

(iii) Strings of a's and b's containing consecutive a's.

(b) Construct a finite state machine that accepts exactly those input strings of 0's and 1's that ends with 11. 5

(c) Design FA which accepts even number of 0's and even member of 1's. 5

3. (a) Find $L(G)$ for *CFG*

$S \to aSb \mid aAb,\ A \to bAa,\ A \to ba$ 5

(b) Convert an *NFA* to a *DFA* given *NFA*

$M = (\Sigma, Q, S, q_0, F),\ \Sigma = \{0,1\},$

$Q = \{q_0, q_1, q_2, q_3\},\ F = \{q_0\}$

S	0	1
q_0	$\{q_0\}$	$\{q_0, q_1\}$
q_1	$\{q_2\}$	$\{q_2\}$
q_2	$\{q_3\}$	$\{q_3\}$

10

(c) Convert the following grammar G in *GNF* form $S \to ABb \mid a,\ A \to aaA \mid B,$ $B \to bAb$ 5

4. *(a)* Show that $id + id * id$ can be generated by two distinct leftmost derivation in the grammar

$E \to E + E \mid E * E \mid (E) \mid id$ 5

(b) Let $G = (N, T, P, S)$,

$P = \{S \to A1B \mid a,\ A \to OA \mid \in,\ B \to OB \mid 1B \mid \in\}$

Give a leftmost and rightmost derivation for the string $00|0|$. 5

(c) Construct a minimum state automaton equivalent to the following transition system. 10

State	**Input**	
	a	*b*
$\to q_0$	q_0	q_3
q_1	q_2	q_5
q_2	q_3	q_4
q_3	q_0	q_5
q_4	q_0	q_6
q_5	q_1	q_4
(q_6)	q_1	q_3

5. *(a)* Define Pushdown Automaton. What are the different ways of language acceptances by a *PDA* and define them. 2+3=5

(b) Convert the given expression to *PDA*

$I \rightarrow a|b|Ia|Ib|I0|I1$ 5

(c) Which is more powerful *NFA* or *PDA* ? Justify your answer with example. 5

(d) State the pumping lemma for *CFL*'s. 5

6. Write short notes on : 4×5=20

(a) Chomsky Hierarchy

(b) Context Sensitive Language

(c) Turing Machine

(d) Mealy and Moore Machine.
