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JAYPEE UNIVERSITY OF INFORMATION TECHNOLOGY, WAKNAGHAT

TEST -3 EXAMINATION-DEC. 2018

B.Tech. Vth Semester

COURSE CODE: 10B11CI513 MAX. MARKS: 35

COURSE NAME: Theory of Computation

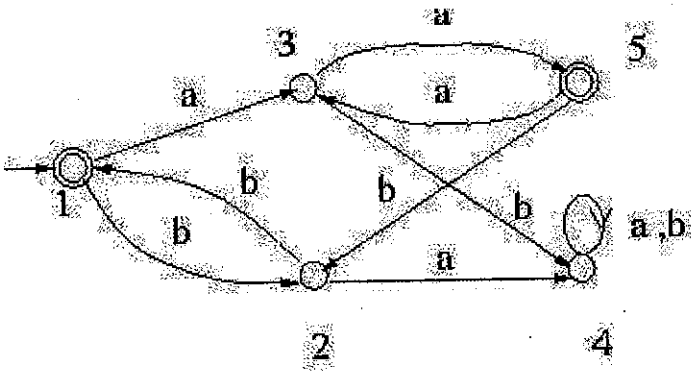
COURSE CREDITS: 04 MAX. TIME: 2 hr

Note: *All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means.* ϵ represents empty string.

Ques 1: a) Explain the Chomsky hierarchy in detail with diagram **[3+3 MARKS]**

b) Explain different variants of Turing machine.

Ques 2: a) Minimize the number of states for the following DFA. **[5+5 MARKS]**



b) Construct a Context free grammar for the language L (M), where

M = ($\{q_0, q_1\}$, {0, 1}, $\{z_0, x\}$, δ, q_0, z_0, ϕ) and δ is given by the following PDA transitions:

$\delta(q_0, 1, z_0) = (q_0, xz_0)$

$\delta(q_0, 1, x) = (q_0, xx)$

$\delta(q_0, 0, x) = (q_1, x)$

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

$\delta(q_1, 1, x) = (q_1, \varepsilon)$

$\delta(q_0, 0, z_0) = (q_0, z_0)$

Ques 3: Design a Turing machine that accepts the language L = $\{a^n b^m a^n : m > n\}$ **[5 Marks]**

Ques 4: Construct a two-tape Turing machine that accepts strings in which each a's is followed by an increasing number of b's; that is, the strings are of the form. **[7 Marks]**

$$ab^{n_1}\, ab^{n_2} \ldots\ldots ab^{n_k}, k > 0 \text{ where } n_1 < n_2 < \cdots n_k$$

Ques 5: Design a Turing machine that computes the following function **[7 Marks]**

F(N) = N+2

i.e, the Turing Machine takes as input a number N (in Binary) and adds 2 to it in binary. To be precise, the tape initially contains a \$(or ▶left end marker) followed by a blank symbol followed by N in binary. The tape head is initially scanning the \$ in initial state q_0. Your TM should halt with N + 2, in binary, on its tape, scanning the leftmost symbol of N + 2, in final state qf. For example, $q_0\$10011 \vdash^* \$q_f\ 10101$, and $q_0\$11111 \vdash^* \$q_f 100001$.