

CS402 Theory of Automata

Final Term Examination – Spring 2005

Time Allowed: 150 Minutes

Instructions

Please read the following instructions carefully before attempting any question:

1. This examination is closed book, closed notes, closed neighbors.
2. Answer all questions.
 - a. There is no choice.
 - b. You will have to answer correctly all questions in this examination to get the maximum possible marks.
3. Do not ask any questions about the contents of this examination from anyone.
 - a. If you think that there is something wrong with any of the questions, attempt it to the best of your understanding.
 - b. If you believe that some essential piece of information is missing, make an appropriate assumption and use it to solve the problem.
4. You are allowed to use any Software for Diagrams and Symbols like MS Word, MathType and Visio etc.

****WARNING: Please note that Virtual University takes serious note of unfair means. Anyone found involved in cheating will get an `F` grade in this course.**

Total Marks: 50

Total Questions: 09

Question No. 1

Marks : 02

A Total Language Tree has

- ☐ All languages over Σ
- ☐ All strings over Σ
- ☐ All words of all languages over Σ

- All words of one language over Σ

Question No. 2

Marks : 10

(a) Derive any two words of length 4 from the following CFG.

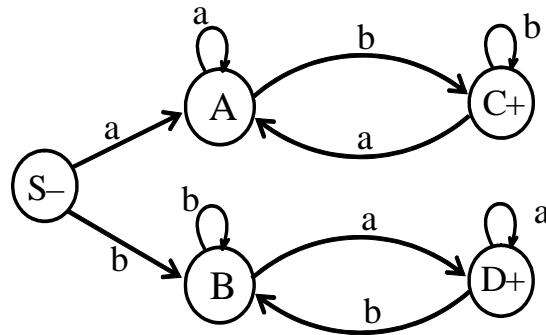
$$S \rightarrow XaaX, X \rightarrow aX|bX|\gamma.$$

Write the corresponding RE as Well.

(5)

(b) Determine the CFG, corresponding to the following FA

(5)



Question No. 3

Marks : 02

What Turing Machine does not have?

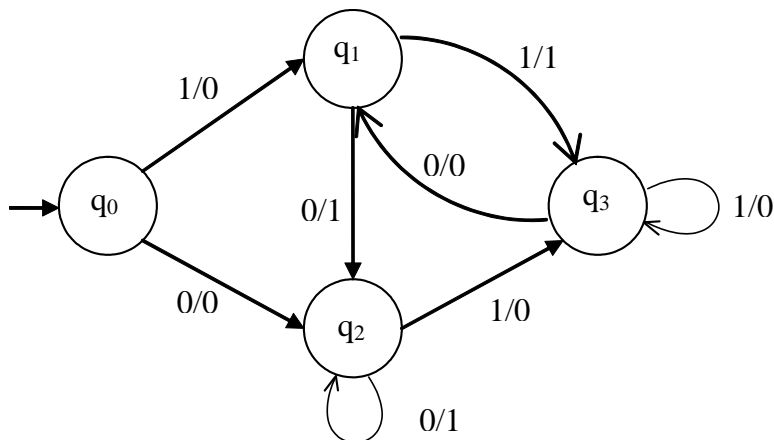
- Stack
- Tape
- Head
- Word

Question No. 4

Marks : 10

(a) Draw Moore Machine equivalent to following Mealy Machine.

(5)



(b) Use Pumping Lemma II to show that following language is non-regular.

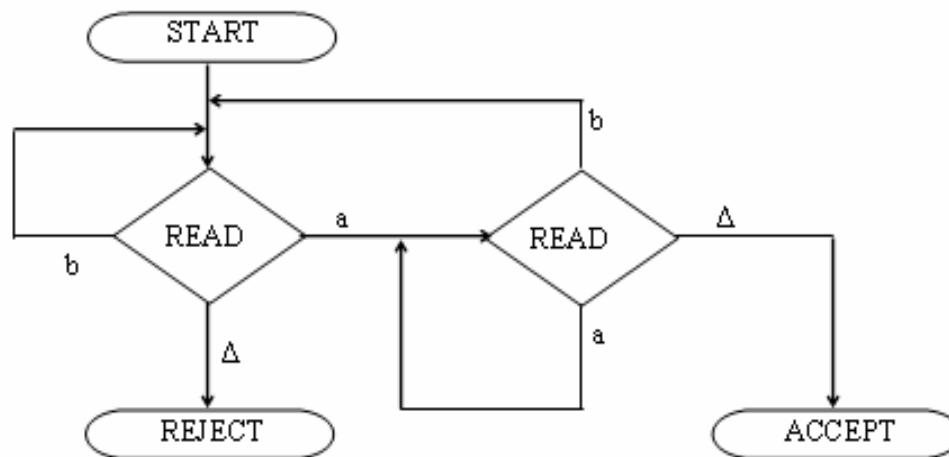
(5)

- i. Square (a^{n^2} , for $n = 1, 2, 3, \dots$)

Question No. 5

Marks : 10

Identify the language accepted by the following PDA. Build an FA accepting the corresponding language. Write the corresponding RE as well.



Question No. 6

Marks : 02

Two FAs represent same languages over some alphabet (may or may not be same for FAs), If

- ☐ They accept same words
- ☐ They accept same number of words
- ☐ They reject same words
- ☐ None of above

Question No. 7

Marks : 02

CFG given $S \rightarrow bS|Sb|aa$ represents language

- ☐ b^*aa
- ☐ aab^*
- ☐ b^*aab^*
- ☐ $b^*(aa)^*b^*$

Question No. 8

Marks : 10

a) Define the following terms

(6)

- i. Total language tree (TLT)
- ii. Ambiguous CFG.
- iii. Unit Production

(b) Find Context Free Grammar's (CFG's) for the following languages over the $\Sigma = \{a, b\}$.

(4)

- i. All the words that do not contain substring abb.
- ii. All the words that have exactly two or three b's.

Question No. 9

Marks : 02

A Language that is finite but not regular

- ☐ Λ
 - ☐ $(a+b)^*$
 - ☐ Φ
 - ☐ All strings of a's in $\Sigma = \{a, b\}$
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