

# CS402 Theory of Automata

Final Term Examination - February 2004  
Session -II

Time Allowed: 150 Minutes

Please read the following instructions carefully before attempting any question:

1. The duration of this examination is **150 Mins**.
  2. This examination is **closed book, closed notes, closed neighbors**; any one found cheating will get no grade.
  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. Most, but not all, of the examination consists of MCQ's. Choose only one choice as your answer.
  5. You are allowed to use any Software for Diagrams and Symbols like MS Word, Math Type and Visio etc.
- 

Total Questions 12

## Q No. 1

Choose the right option: (2)

- A) aAbB is a string defined on an alphabet {aA, bB, aAbB}.
- B) aAbB is a string defined on an alphabet {aA, bB}.
- ☐ B only
  - ☐ A only

## Q No. 2

Choose the right option: (2)

- A) For every NFA, there may not be an FA equivalent to it
- B) For every NFA, there must be an FA equivalent to it
- ☐ B only
  - ☐ A only

## Q No. 3

Choose the right option: (2)

- A) In a Mealy machine, the set of letters and the set of output characters must be same
- B) In a Mealy machine, the set of letters and the set of output characters may not be same
- ☐ B only
  - ☐ A only

**Q No. 4**

Choose the right option: (2)

- A) Pumping Lemma version I is sufficient to test an infinite language to be regular
- B) To test an infinite language to be regular, Pumping Lemma version I may not help
  - B only
  - A only

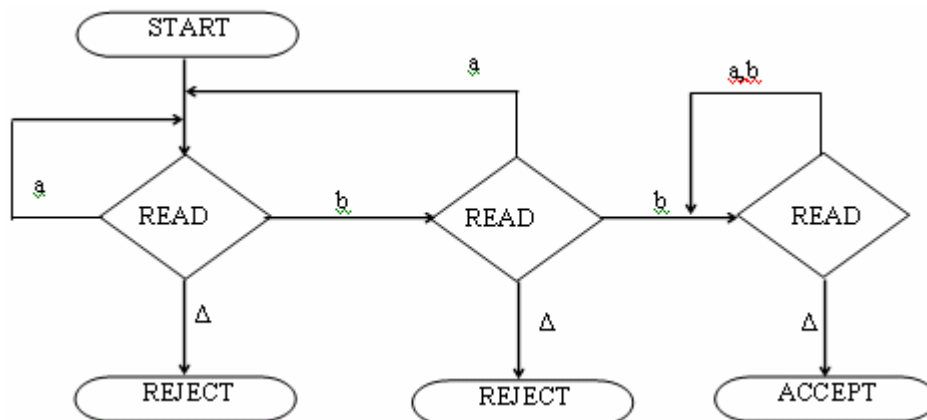
**Q No. 5**

Choose the right option: (2)

- A) For a given CFG, there may not exist any PDA accepting the language generated by the CFG
- B) For a given CFG, there must be a PDA accepting the language generated by the CFG
  - B only
  - A only

**Q No. 6**

Identify the language accepted by the following PDA. Build an FA accepting the corresponding language. Write the corresponding RE as well (10)



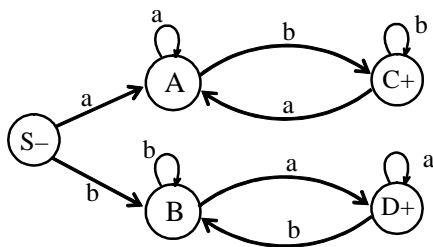
**Q No. 7**

Derive any two words of length 4 from the following CFG. (5)

$S \rightarrow XaaX, X \rightarrow aX \mid bX \mid \epsilon$

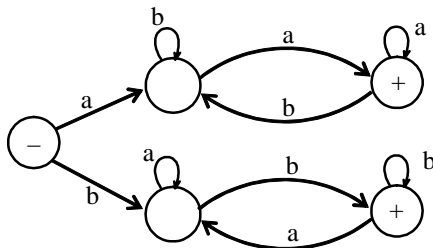
**Q No. 8**

Determine the CFG, corresponding to the following FA (5)



**Q No. 9**

By identifying at least 4 strings of length 4 each, determine the language accepted by the following FA (5)

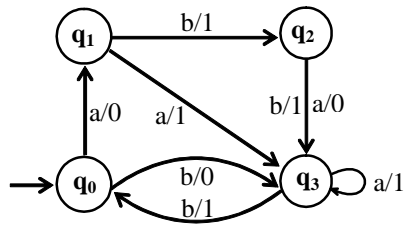


**Q No. 10**

Using complementing and incrementing technique, subtract 67 from 83. (convert the numbers to the binary form first) (5)

**Q No. 11**

Construct the transition table of the following Mealy machine (5)



### Q No. 12

Show that the strings aabb and aaabbbb of the language  $L = \{a^n b^n : n = 1, 2, 3, \dots\}$  does not fulfill the conditions of Pumping Lemma Version I. (5)