

2002 SCHEME

USN

--	--	--	--	--	--	--	--	--	--

CS44

Fourth Semester B.E. Degree Examination, June/July 2011

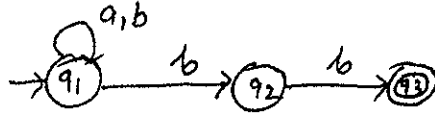
Finite Automata and Formal Languages

Time: 3 hrs.

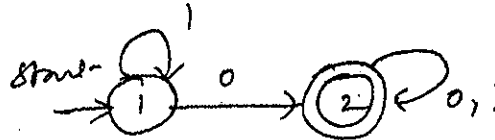
Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. Define the terms alphabets, string, length of string, power of an alphabet and language, with an examples for each. (05 Marks)
- b. Define DFA and construct a DFA for accepting set of all strings ending in aba, where $\Sigma = \{a, b\}$. Write transition function and define all parameters of DFA. (10 Marks)
- c. Convert the following NFA to a DFA: (05 Marks)



- 2 a. Define regular expressions and write note on two applications of regular expressions. (08 Marks)
- b. Convert the DFA given below to a regular expression. (12 Marks)



- 3 a. State and prove pumping lemma for regular languages and use it to prove that $L = \{a^m b^m \mid m \geq 1\}$ is not regular. (16 Marks)
- b. Convert the following regular expression to NFA - ϵ transitions : (04 Marks)
 - i) $(0 + 1) 0 1$
 - ii) $0 0 (0 + 1)^*$

- 4 a. Define context-free grammar and construct : i) Parse tree, ii) Leftmost derivation, iii) Rightmost derivation, for the sentence $(a + b)^* c$ using the grammar given below :

$$E \rightarrow E + T \mid T$$

$$T \rightarrow T * F \mid F$$

$$F \rightarrow (E) \mid a \mid b \mid c$$

(10 Marks)

- b. Define ambiguous grammar and show that the grammar given below is ambiguous :

$$E \rightarrow E + E$$

$$E \rightarrow E * E$$

$$E \rightarrow a \mid b \mid c$$

(05 Marks)

- c. Write a note on applications of context-free grammars. (05 Marks)

- 5 a. Define PDA and construct a PDA for the following languages :

$$L = \{ a^i b^j c^k \mid i + j = k \text{ and } i, j, k \geq 0 \}$$

(12 Marks)

- b. State and prove pumping lemma for context-free languages. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and/or equations written eg, 42+8 = 50, will be treated as malpractice.

- 6 a. Distinguish between DPDA and NPDA. Give one example which NPDA solves, but DPDA will not that is able to solve. (04 Marks)
- b. Eliminate useless-symbols from the grammar given below :

$$S \rightarrow aS | A | c$$

$$A \rightarrow a$$

$$B \rightarrow aa$$

$$C \rightarrow aCb$$

(06 Marks)

- c. Define Chomsky Normal form and Greibach Normal form and convert the following grammar to Chomsky Normal form:

$$S \rightarrow bA | aB$$

$$A \rightarrow bAA | aS | a$$

$$B \rightarrow aBB | bS | b$$

(10 Marks)

- 7 a. Define a Turing machine and design a Turing machine to accept the language :

$$L = \{a^n b^n | n \geq 1\}$$

(12 Marks)

- b. Write notes on :

i) Multi tape turing machine

ii) Non-deterministic turing machine.

(08 Marks)

- 8 a. Show that if L is a recursive language, so is \bar{L} . (06 Marks)
- b. Show that if both a language L and its complement are R.E., then L is recursive. (06 Marks)
- c. Define Post's correspondence problem (PCP) and solve the following PCP problem :

	List A	List B
i	w_i	n_i
1	1	111
2	10111	10
3	10	0

(08 Marks)
