

g© iMNNfAE

CHIK001

A Y

15CS/IS54

Semester B.E. Degree Examination,, June/July 2019
Automata Theory and Computability

Time: 3 hrs.

Max. Marks: 80

Note: Answer au FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Define the following : i) string ii) alphabet iii) language. (06 Marks)
- b. Design a deterministic finite state machine for the following language over $\Sigma = \{a, b\}$.
 - i) $L = \{w \mid w \text{ mod } 3 = 1\}$ (10 Marks)
 - ii) $L = \{w \mid w \text{ ends either with } ab \text{ or } ba\}$

OR

- 2 a. Write a note on finite state transducers. (07 Marks)
- b. Define DFSM? Minimize the following FSM, [Refer Fig.Q2(b)]

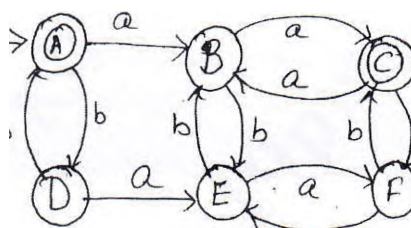


Fig.Q2(b)

(09 Marks)

Module-2

- 3 a. Write the equivalent Regular Expression for the given Finite state machine. (08 Marks)

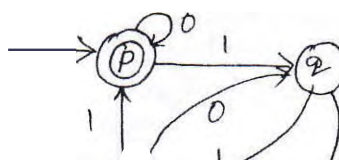


Fig Q3(a)

- b. Write the Regular Expression for the following language.
 - i) $\{w \in \{a, b\}^* \mid w \text{ has at most one } a\}$
 - ii) $\{w \in \{a, b\}^* \mid w \text{ does not end with } ba\}$
 - iii) $\{w \in \{0, 1\}^* \mid w \text{ has substring } 001\}$
 - iv) $\{w \in \{0, 1\}^* \mid w \text{ is even}\}$ (08 Marks)

OR

- 4 a. State and prove the pumping theorem for regular language. (08 Marks)
- b. Show that the language $\{w \in \{a, b\}^* \mid w \text{ is not regular}\}$ is not regular. (08 Marks)

15CS/IS54

Module-3

5 a. Define grammar. Write the CFG for the following language.

$$i) \{ w \in \Sigma^* \mid \ln_a(w) = n_b(w) \}$$

$$ii) L = \{ a^i b^j \mid i = j + 1 \}.$$

(08 Marks)

b. What is inherent ambiguity? Show that the language given is inherently ambiguous?

$$L = \{ a^n b^n c^m \mid n, m > 0 \}$$

(08 Marks)

OR

 6 a. Define PDA? Design PDA for the language $L = \{ a^n b^m \mid n, m > 0 \}$

(06 Marks)

 b. Convert the following language from CFG to PDA $L = \{ ww^R \mid w \in \{0, 1\}^* \}$.

(06 Marks)

 c. Convert the following CFG to CNF $E \rightarrow E + E \mid E * E \mid (E) \mid id$.

(04 Marks)

Module-4

 7 a. Prove that the language $L = \{ a^n b^n c^n \mid n \geq 1 \}$ is not context free.

(08 Marks)

b. Prove that CFL are not closed under intersection, complement or difference?

(08 Marks)

OR

 8 a. Design a Turing machine to accept $L = \{ a^n b^n c^n \mid n \geq 1 \}$.

(08 Marks)

b. Define a Turing machine. Explain the working of a Turing machine.

(05 Marks)

c. Write a note on multitape machine.

(03 Marks)

Module-5

9 Write a short notes on

a. Growth rate of function

(05 Marks)

b. Church-Turing thesis

(06 Marks)

c. Linear bounded automata.

(05 Marks)

OR

10 Write a short notes on

a. Post correspondence problem

(05 Marks)

b. Halting problem in Turing machine

(05 Marks)

c. Various types of Turing machine.

(06 Marks)

 1A, LE, S.

\et

\$re 410) *