[Total No. of Questions - 9] [Total No. of Printed Pages - 3] (2125)

15099

B. Tech 4th Semester Examination

Theory of Automata & Computation (OS)

CS-4003

Time : 3 Hours **Max. Marks : 100**

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt five questions in all, selecting one question each from sections A, B, C and D. Section - E is compulsory.

SECTION - A

1. (a) Define deterministic finite automata. Design a DFA, the language recognized by the automata being

   $L = \{a^n b : n \geq 0\}$ (10)

   (b) Given $\Sigma=\{a, b\}$, construct a DFA that shall recognize the language

   $L = \{b^m a b^n : m, n > 0\}$ (10)

2. Represent the following sets by regular expressions

   (a) $\{\wedge, ab\}$

   (b) {1, 11, 111, ...}

   (c) {ab, a, b, bb}

   (d) $\{b^2, b^5, b^8, ...\}$

   (e) $\{a^{2n+1} \mid n > 0\}$ (4×5=20)

[P.T.O.]

SECTION - B

3. (a) State and explain Myhill-Nerode theorem. (10)

   (b) Discuss the closure properties of regular sets. (10)

4. (a) Explain the properties of moore and mealy machines. (10)

   (b) Explain the application of pumping lemma. (10)

SECTION - C

5. (a) Construct a push down automata (PDA) accepting $\{a^n b^m a^m \mid m, n \geq 1\}$ by empty store. (10)

   (b) Discuss the applications of push down machines. (10)

6. (a) Define CFG. Explain with example. (10)

   (b) Convert the grammar $s \rightarrow$ a sb/ab into chomsky normal form. (10)

SECTION - D

7. What is a turing machine? What are the various types of turing machines available? Explain them in brief. (20)

8. Write short notes on the following:

   (a) Chomsky hierarchy of grammars.

   (b) Computability. (10+10=20)

SECTION - E

9. (i) Define regular expression.

   (ii) When NFA becomes DFA?

(iii) List the properties of FSM.

(iv) Define turing machine.

(v) What is meant by recursively enumerable language?

(vi) What is meant by partial recursive function?

(vii) What do you mean by universal turing machine?

(viii) List the various characteristics of unrestricted grammar.

(ix) Define “Unit Production” and “Null Production”.

(x) What is halting problem? (2×10=20)