[Total No. of Questions - 9] [Total No. of Printed Pages - 3]
(2063)

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B.Tech 4th Semester Examination

Theory of Automata & Computation

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 from each of the section A, B, C & D and section E is compulsory.

SECTION - A

1. (a) Construct a Deterministic Finite Automata (DFA) for the regular expression (a|b)*abb. **(10)**

   (b) Show that there exists an NFA that accepts L(R), where R is a regular expression. **(10)**

2. Construct an NFA accepting the set of all strings over alphabet {a, b} ending in aba. Use it to construct a DFA accepting the same set of strings. **(20)**

SECTION - B

3. (a) Describe the method of conversion from Mealy machine to Moore with suitable example. **(10)**

(b) State and prove pumping lemma for context free languages. **(10)**

4. (a) Discuss various minimization algorithms used in finite automata. **(10)**

(b) Briefly explain the closure properties of regular sets with example. **(10)**

SECTION - C

5. (a) Consider a Finite State Machine (FSM) having at least 3 states, and convert it into its Equivalent Push Down Machine (PDM). **(10)**

(b) Convert the following grammar into Chomsky Normal Form (CNF):

$A \rightarrow aAa|bAb|a|b|aa|bb|aaa|bbb$ **(10)**

6. (a) Write a CFG for the language of all words of the form $a^r b^s c^t$ where r, s, t,= 1, 2, 3,... and s=4r+3t. **(10)**

(b) Determine whether the following grammar is ambiguous or not:

$A \rightarrow aAAb|bAAa|bAAAa|\varepsilon$ **(10)**

SECTION - D

7. (a) Construct a Turing Machine that recognizes the set of all strings that contain an odd no. of 1's. **(10)**

(b) Describe the features of deterministic and non-deterministic Turing machines. **(10)**

8. Discuss the following:

   (a) Solution of Halting problem of Turing machine

   (b) Relation between languages and classes **(20)**

SECTION - D
(Compulsory)

9. (a) What are the applications of Gricbach normal form?

   (b) What is Type-0 grammar?

   (c) List the various characteristics of unrestricted grammar.

   (d) What are the applications of Moore machine?

   (e) Define context sensitive grammars.

   (f) Show that proper subtraction function is primitive recursive function.

   (g) What do you understand by Universal Turing machine?

   (h) List the advantages of Push down Automata. **(8×2½=20)**