[Total No. of Questions - 9] [Total No. of Printed Pages - 3] (2064)

14681

B. Tech 4th Semester Examination

Theory of Automata & Computation (O.S.)

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 the entire parts of section E.

SECTION - A

1. (a). Construct a Deterministic Finite Automata (DFA) for the language L = (a+b)* aabb. (10)

   (b) Let r_1, r_2 and r_3 be three regular expressions. Is the language associated with $(r_1 + r_2)r_3$ is same as language associated with $r_1r_3 + r_2r_3$? Justify your answer. (10)

2. (a) Construct a DFA equivalent to the following grammar:

   $S \rightarrow aS|bS|aA$

   $A \rightarrow bB$

   $B \rightarrow aC$

   $C \rightarrow \varepsilon$ (10)

   (b) Describe various applications of finite automata. (10)

SECTION - B

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

(b) Prove that $\{a^n b^n c^n\}$ is non context free using pumping lemma theorem. (10)

4. (a) Discuss the limitations of finite state machines (FSM). (10)

(b) Briefly explain Arden's method for the conversion of NFA into DFA with example. (10)

SECTION - C

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

(b) Convert the following grammar into Griebach Normal Form (GNF):

$A \rightarrow aAa|bAb|a|b|aa|bb$ (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=2r+t. (10)

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

$A \rightarrow aAAb \mid bAAa \mid \varepsilon$ (abab is a string in L(G)) (10)

SECTION - D

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

(b) Differentiate between deterministic and non-deterministic Turing machines. 10

8. Discuss the following:

(a) Halting problem of Turing machine

(b) Unrestricted grammar (20)

SECTION - E (Compulsory)

9. (a) What are the applications of unit productions?

(b) What are Type -2 grammars?

(c) List the various characteristics of regular expressions. ,

(d) What are the applications of Mealy machine?

(e) Define Myhill-Nerode theorem.

(f) Show that exponentiation function is primitive recursive function.

(g) What do you understand by Kleene's closure?

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