Sr. No. 003304

January 2023

B.Tech- III SEMESTER

Theory of Automata & Computation (CE-209C)

Time: 3 Hours **Max. Marks:75**

Instructions:
1. *It is compulsory to answer all the questions (1.5 marks each) of Part -A in short.*
2. *Answer any four questions from Part -B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

PART -A

Q1 (a) Define Kleene closure and Positive closure. (1.5)

(b) Define NDPDA. (1.5)

(c) What are undecidable problems? Give an example. (1.5)

(d) Write a regular expression for the language that accepts the strings of even length. (1.5)

(e) What do you mean by context sensitive languages? (1.5)

(f) Compare the computational power of a pushdown automata and a finite automata. (1.5)

(g) Define grammar and language. (1.5)

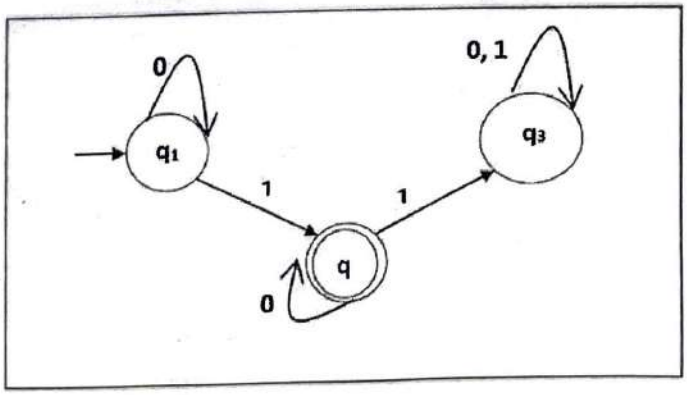
(h) What is a recursively enumerable language? (1.5)

(i) What is the halting problem of a turing machine? (1.5)

(j) Write the closure properties of regular sets. (1.5)

PART -B

Q2 (a) Convert the following finite automata to it's corresponding regular expression using Arden's theorem: (10)



(b) Explain Chomsky Hierarchy of formal languages in detail. (5)

Q3 (a) Explain pumping lemma for regular expressions. (5)

Normal form:

S -> bS | BcA
A -> aA | BBa
B -> ba | ϵ

Q4 Define Pushdown Automata. Construct a PDA for $0^n1^m2^m3^n$ where n,m≥1. (15)

Q5 (a) Write a regular expression for the language that accepts all the strings of 0's and 1's such that (5)

i) the strings begin with 1 and do not contain a substring 001.
ii) The strings start with 00 or end with 00.

(b) What are parse trees? Explain the concept of ambiguity in CFG. (10)

Q6 (a) Differentiate between Mealy machine and Moore machine. Design a Mealy machine to find out 2's complement of a binary number. (10)

(b) Check if the following grammar is ambiguous or not: (5)

S → aB / bA
A → aS / bAA / a
B → bS / aBB / b

Also determine if it accepts the string "aaabbabbba".

Q7 Design a turing machine that accepts the strings containing equal no. of a's and b's. (15)

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