

INTEGRATED M.C.A. SEM – IX: WINTER - 2022
SUBJECT: FINITE AUTOMATA & GRAMMARS

Day: Wednesday
Date: 28-12-2022 W-10103-2022

Time: 10:00AM-11:00
Max. Marks: 100 P.M.

N.B.:

- 1) Attempt any **FOUR** questions from Section –I and any **TWO** questions from Section –II.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SAME** answer book.

SECTION – I

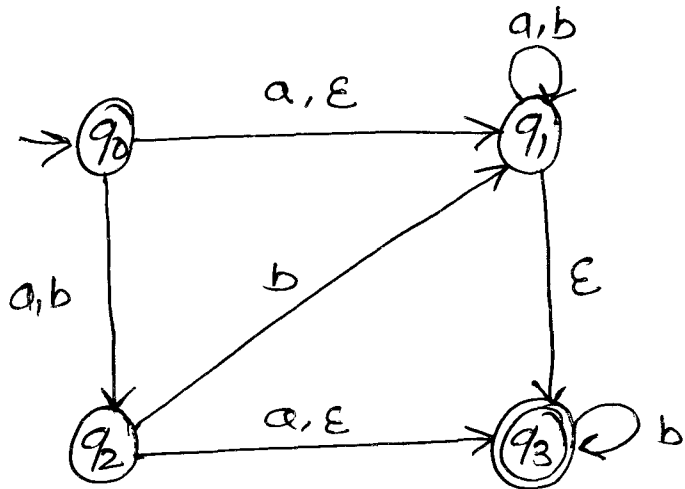
- Q.1** a) Construct a DFA for set of strings containing either substring “111” or “222” over {1,2} (07)
- b) Construct NFA- ϵ for the following Regular Expression (08)
- i) $(2(11)^*1 + (12)^*1)^*$
 - ii) $(12 + 21)^* + (21 + 12)^*$
- Q.2** a) Prove that regular sets are closed under union, concatenation and closure with an example. (07)
- b) Find the CNF equivalent to given CFG (08)
- $S \rightarrow aAbB$
 $A \rightarrow aA|a$
 $B \rightarrow bB|b$
- Q.3** a) Using pumping lemma prove that the language is not regular (07)
- $L = \{ 0^n 1^{2n} \mid n > 0 \}$
- b) Design a FA that reads strings made of letter in the word ‘UNIVERSITY’ and recognize these strings that contains the word ‘UNITY’ as substring. (08)
- Q.4** a) Convert the following CFG into equivalent GNF. (08)
- $S \rightarrow AB|B$
 $A \rightarrow BS$
 $B \rightarrow A1|1$
- b) Design FSM for divisibility by 3 tester for decimal numbers. (07)
- Q.5** a) Construct Regular Expression for language over alphabet {a,b}. Which accepts all string starting with ‘a’ and not having substring ‘bbb’ in it. (07)
- b) Consider the following grammar $G = (\{S, A, B\}, \{a, b\}, P, S)$ where P is (08)
- $S \rightarrow aB|bA$
 $A \rightarrow a|aS|bAA$
 $B \rightarrow b|bS|aBB$
Find leftmost and rightmost derivation for the string “aababb”.

P. T. O.

SECTION-II

Q.6 Design PDA for language over alphabet {a, b} where language is defined as (20)
 $L = \{a^n b^{n^2} \mid n \geq 1\}$

Q.7 Find an equivalent DFA to the NFA- ϵ (20)



Q.8 a) Explain equivalence theorem of PDA and CFL with an example. (10)

b) Write an algorithm for minimization of automata. (10)

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