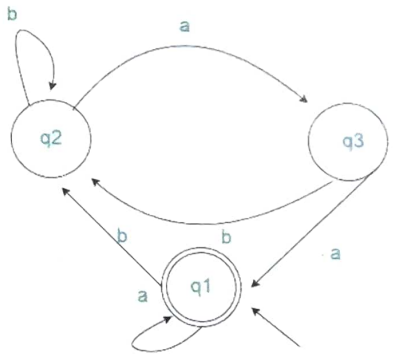
School of Computer & Systems Sciences
CS - 119, Formal Language and Automata Theory
MCA II – Semester
Mid Semester Examination - 2019

Time: 120 Minutes **Max. Marks: 25**

Note: Attempts any five questions.

Q1. Find the regular expression for
(i) $L = \{a^{2n}\, b^{2m+1} : n \geq 0, m \geq 0\}$ *(2.5+2.5)*
(ii) Set of strings consisting of even number of a's followed by odd number of b's

Q2. Find the regular expression using Arden's Theorem *(5)*



Q3. (a) The *nor* of two languages is $nor(L_1, L_2) = \{w: w \notin L_1 \text{ and } w \notin L_2\}$. Show that the family of regular languages is closed under the *nor* operation. *(2.5+2.5)*
(b) Show that the language $L = \{a^n b^n : n \geq 1\}$ is not regular.

Q4. (a) Let $L_1 = L(a^*baa^*)$ and $L_2 = L(aba^*)$. Find L_1/L_2. *(2.5+2.5)*
(b) Show that the following grammar is ambiguous

$$S \rightarrow SS/aSb/bSa/\lambda$$

Q5. (a) Find the s-grammar for
$L = \{a^n b^n : n \geq 1\}$. *(3+2)*

(b) Eliminate all λ-productions from

$$S \rightarrow AaB/aaB$$
$$A \rightarrow \lambda$$
$$B \rightarrow bbA/\lambda$$

Q6. (a) Find a context-free grammar for the set of all regular expressions on the alphabet $\{a, b\}$ *(2+3)*

(b) Transform the grammar

$$S \rightarrow ABb/a$$
$$A \rightarrow aaA/B$$
$$B \rightarrow bAb$$

into Chomsky normal form.