



Sessional-I	Sessional-II	Terminal Examination - Fall 2017	Grade	30
Automata Theory		CSC312		
Dr. Ashfaq Ahmad		BS Computer Science		
	Fall 14-BCS	A, B, C		
180 Minutes		Maximum Marks	50	

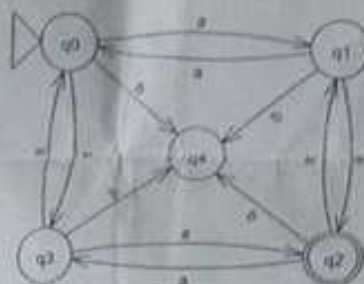
Important Instructions / Guidelines:

- Answer all questions.
- Show your complete work, as partial credit will be given. You will be graded not only on the correctness of your answer, but also on the clarity and method correctness with which you express your answer.
- Do not give multiple answers to a question. Clearly cross out what you do not want me to read.
- Do not use lead pencil.
- Turn off your mobile phone, no silent mode.

Question 1:

State the language accepted by the following NFA and convert this NFA to an equivalent DFA.

[2+3]



even a^2s
(aa)^{*}

Question 2:

Define the three parts of Kleen's theorem. Construct a finite automata FA1 that accepts the language of all strings that start with a δ and end at a and a finite automata FA2 that accepts the language of all strings in which the letter δ is never tripled. Then, find a finite automata FA3 that

[3+2+5+5]

- Represents the union of the FA1 and FA2.
- Represents the concatenation of FA1 and FA2.

Question 3:

Convert the following arithmetic expression into a syntax tree and then solve it using both prefix and postfix notations.

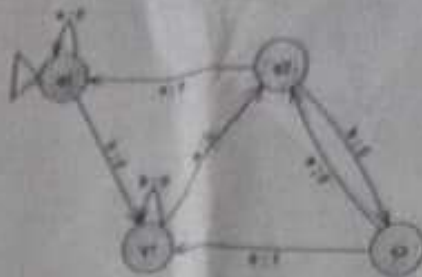
[2.5+2.5]

$$(2 * (40 - 9 * 4)) + 3 * (2 - 1)$$

Question 4:

Convert the following Mealy machine into its equivalent Moore machine.





Question 5:

Generate the Syntax tree for the input $abbbcbcc$ over the CFG

$$S \rightarrow AB$$

$$A \rightarrow aAb | ab$$

$$B \rightarrow bBc | bc$$

Question 6:

Write the Regular Expression of the language generated by the following CFG.

$$S \rightarrow SS$$

$$S \rightarrow XS$$

$$S \rightarrow SX$$

$$S \rightarrow \lambda$$

$$S \rightarrow YSY$$

$$X \rightarrow aa|bb$$

$$Y \rightarrow ab|ba$$

Question 7:

Find context-free grammars (CFG's) for the following languages over the alphabet set $\{a, b\}$

- All words that have an equal number of a 's and b 's in them.
- All words in which letter b is never tripled.

~~$S \rightarrow aS$
 $S \rightarrow bS$
 $S \rightarrow aSb$
 $S \rightarrow bSa$
 $S \rightarrow \lambda$~~

$$S \rightarrow aB$$

$$S \rightarrow bA$$

$$A \rightarrow a$$

$$A \rightarrow aA$$

$$A \rightarrow bAA$$

$$B \rightarrow b$$

$$B \rightarrow bB$$

$$A \rightarrow aBB$$