CS-301Thoery of Automata

Serial No:

Final Exam
Total Time: 3 Hours
Total Marks: 100

Friday, December 21, 2018

Course Instructor(s)

Dr Waseem Shehzad, Noshina Tariq, Mehreen Alam

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Signature of Invigilator

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Student NameRoll No   Section   Signature

DO NOT OPEN THE QUESTION BOOK OR START UNTIL INSTRUCTED.

Instructions:

1. Attempt on question paper. Attempt all of them. Read the question carefully, understand the question, and then attempt it.
2. No additional sheet will be provided for rough work. Use the back of the last page for rough work.
3. If you need more space write on the back side of the paper and clearly mark question and part number etc.
4. After asked to commence the exam, please verify that you have eleven (**11**) different printed pages including this title page. There are a total of eight (**8**) questions.
5. Calculator sharing is strictly prohibited.
6. Use permanent ink pens only. Any part done using soft pencil will not be marked and cannot be claimed for rechecking.

	Q-1	Q-2	Q-3	Q-4	Q-5	Q-6	Q-7	Q-8	Total
Marks Obtained									
Total Marks	10	10	10	10	20	10	10	10	100

Vetted By: _____**Vetter Signature:** _____

Question 1 [10Marks]

Build a PDA that accepts the language $L = a^n b^m a^{m+1} b^{n+1}$, where n, m = {1, 2, 3, ….}.

Question 2 [10Marks]

Prove that the language $P = a^n b^n a^n b^n$ is a non-context free language by using self embedded pumping lemma. You must incorporate the concept of self-embedded-ness.

Question 3 [10Marks]

Convert the following grammar to GNF.

        S -> Xa | Yb | YYYb

        W -> ZZ | SZZ | W | Δ

        X -> Sb | b | SZZ

        Y -> Sa | a | Z| Δ

        Z -> ZZ | SZZ

Question 4 [10Marks]

Write regular expression for the language accepted by following TG (Transition Graph).
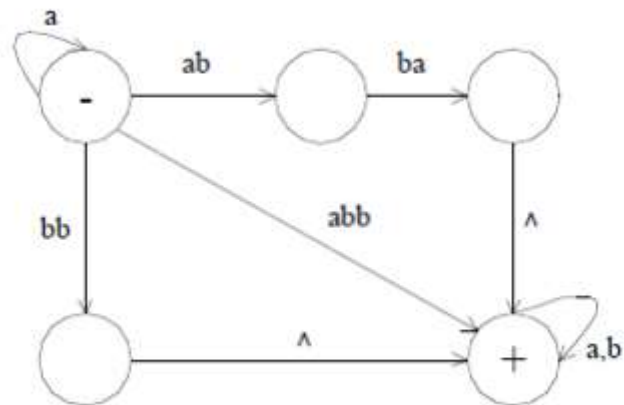
Question 5 [20Marks]

If TM takes a sequence of numbers as input and leaves only one number as output, we call it a computable function. Build a Turing machine that takes input two non negative numbers and performs the **mod** operation on them, i.e **mod(3,7)=3 and mod(7,3)=1**. You may use the utilities INSERT and DELETE, if needed. Clearly specify any assumptions and how you are taking the input and leaving the output value.

Question 6 [10Marks]

a. For the language $a^n b^n c^n d^n e^n f^n$, solve using n-stack PDA, where $n > 2$.

b. Is it doable using 2-stack PDA. Only answer in Yes/No?

c. Can you suggest correlation with n-stack PDA and 2-stack PDA, if any.

Question 7 [10Marks]

Build a Turing Machine for the language $\{a^n b^{n+1}\}$.

Question 8 [10Marks]

Build a Post Machine that takes in any strings of a's and b's and leaves in its STORE the complement that has the a's and b's switched, e.g. on input abab and bbaa, the output left on the STORE is baba and aabb respectively.`