**National University of Computer and Emerging Sciences**

**(Islamabad Campus)**

Department of Computer Science

**Signature of Invigilator: \_\_\_\_\_\_\_\_\_\_\_\_ Serial No:\_\_\_\_\_\_\_\_\_**

cs-301 Theory of Automata

Mid-I Examination (Fall 2012)

**Instructor(s):**

Dr. Waseem Shahzad, Mrs. Ramoza Ahsan, Ms Mehreen Alam

Oct 1, 2012

**Total Marks: 60 Time Allowed: 1 hour**

Instructions

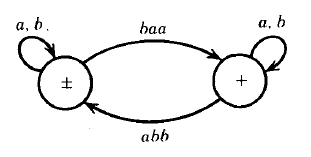
1. Examination is closed books/notes. No notes, cheat sheets, textbook, or printed material allowed.
2. Make sure you have all the 4 Pages.
3. Answer only in the space provided. You may use the back side for rough work.
4. If you believe that some essential piece of information is missing, make an appropriate assumption and use it to solve the problem.
5. You have to return the complete booklet.
6. Write your name and roll number on each page.

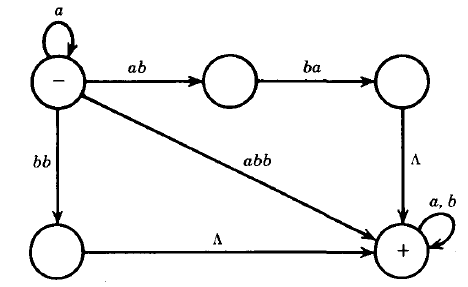
**Roll No: \_\_\_\_\_\_\_\_\_\_\_\_\_ Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Section: \_\_\_\_\_\_\_\_\_**

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| --- | --- | --- | --- | --- | --- | --- | --- |
| Question | 1 | 2 | 3 | 4 | 5 | 6 | Total |
| Points |  |  |  |  |  |  |  |
| Score |  |  |  |  |  |  |  |

Vetted By: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Vetter Signature: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **[5+5 = 10pts] Give recursive definition of the following**
   1. **Language S\* where S = {aa,b}**
   2. **Set POWERS-OF-TWO = { 1,2,4,8,16,…}**
2. **[2.5+2.5 = 5pts]Describe (in English phrases) the languages associated with the following regular expression.**
   1. **(a+b)\* a (null word+bbbb)**
   2. **(b(bb)\*)\* (a(aa)\*b(bb)\*)\*(a(aa)\*)\***
3. **[10pts] Write RE for the language consisting of words that DONOT contain even number of a’s.**
4. **[10pts] Design an FA for the language where every word has ODD a’s and EVEN b’s.**
5. **[5pts] Design a TG for the language where no word contains the substring bba**
6. **[10+10 = 20pts] Convert the following TGs to REs. Do show the necessary steps.**

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