**National University of Computer & Emerging Sciences, Karachi**Fast

**Spring-2023 CS-Department  
Assignment 1**

**Deadline 24 February 2023**

| **Course Code: CS301** | **Course Name: Theory of Automata** |
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**SECTION-A**

**Question 1: Develop a regular expression and DFA for the following language over the alphabet P = {a, b}**

1. **All words in which a appears 5 times, if at all. This means that every clump of a's contains 5 or 10 or 15 or 20... a's.**
2. **All words that contain exactly two b's or exactly three a's, not more.**
3. **All strings that end in a double letter or start with a double letter.**
4. **All strings in which the letter b is never tripled. This means that no**

**word contains the substring bbb.**

1. **All strings that do not have the substring bab.**
2. **All strings in which the total number of a's is divisible by two (Mod 3), such**

**as aba, ababababa, aabaabbabaaa.**

1. **All strings that have an even number of a's and an odd number of b's.**

**SECTION-B**

**Q-1 Write a regular expression to validate a Pakistan Home Address. Provide the string which you are considering while designing R.E.State your alphabet set based on the requirement of question.**

**Add parentheses to the regular expression to remember the street number which is: (613) and apartment number which is:( Apt 57).**

**For the addresses**

**1- House # A-307, Sector 11B, North Karachi**

**(A-307),(11B),NorthKarachi**

**2- Street 89/Block #123 /Sector # 234 , Apt 118, Askari 4**

**(89)/(123)/(234),(Apt 118),Askari4**

**Q-2 Develop RE for the following scenarios .State your alphabet set based on the requirement of the question.**

**a) A string that has either "comp" or "imp"**

**b) A string that ends with “virus”**

**c) A string that has a “z” followed by at least one “o”**

**Example: computer zombie virus, important zone virus, compliment zone virus, etc**

**Q-3 Write a regular expression which will check if that string input has a consonant followed by a vowel followed by a consonant pattern.State your alphabet set based on the requirement of question.State your alphabet set based on the requirement of the question.**

**Examples: bala, dada, mama, doramon, balu, nano ,sat,cat.**

**Q-4 Write a regular expression which will check a string to confirm that it contains at least 1 number, at least 1 uppercase letter, at least 1 special symbol (!@#$%^&\*), and is at least 4 characters long.State your alphabet set based on the requirement of the question.**

**Example of Valid String : ??12A123$@ , $124AS??SDD% ,248mL#, Ug91!.**

**Q-5 Write the regular expression to validate the VISA Card along with Valid Thru and CC digits. More over your regular expression is also able to validate IBAN Number of any Pakistani Bank**

**In Pakistan, the IBAN consists of 24 alphanumeric characters: first the two-letter**

**denotes the country code (PK), and then two check digits, and finally a country-**

**specific Basic Bank Account Number (BBAN), which in segregated in Pakistan as**

**a bank&#39;s identifier (4 digits) and the account number (16 digits).**

**Dummy Card Information Set 1 (Visa)**

**Long card number (16 characters): 4111111111111111**

**CVC code (3 characters): 111**

**Example : 1426 3920 4121 3746 861 , PK98ALFH0194001005801740**