Write the regular expressions for the following languages over the alphabet \{a,b,c\}

1) Strings containing $abc$ as a substring [Marks: 3]

ONE POSSIBLE SOLUTION: $(a + b + c)^* abc (a + b + c)^*$

2) Strings in which the first symbol is same as the last [Marks: 3]

ONE POSSIBLE SOLUTION: $a (a + b + c)^* a + b (a + b + c)^* b + c (a + b + c)^* c$

Write the regular expressions for the following language over the alphabet \{1,2\}

3) Strings containing even number of 2’s [Marks: 4]

ONE POSSIBLE SOLUTION: $(1^* 21^* 21^*)^* + 1^*$