2] Let S be the permutation:

1-> 13, 2-> 2, 3-> 15, 4-> 14,5->10, 6->6,7->12, 8->3,9->4,10->1,11->7,12->9,13->5,14->11,15->8

And let T be the permutation:

1 -> 14, 2->9,3->10,4->2,5->12,6->6,7->5, 8->11,9->15,10->3,11->8,12->7,13->4,14->1,15->13

Find the cycle decomposition of the following permutations: S, T, S^2, ST, TS,T^2S

Solution:

First S:

Map Cyclic Element

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1-> 13 (1 13

13-> 5 (1 13 5

5-> 10 (1 13 5 10

10-> 1 (1 13 5 10)

2-> 2 (1 13 5 10)

3-> 15 ( 1 13 5 10)( 3 15

15-> 8 ( 1 13 5 10)(3 15 8

8-> 3 (1 13 5 10)(3 15 8)

4-> 14 (1 13 5 10)(3 15 8)(4 14

14-> 11 (1 13 5 10)(3 15 8)(4 14 11

11-> 7. ( 1 13 5 10)(3 15 8)(4 14 11 7

7-> 12 ( 1 13 5 10)(3 15 8)( 4 14 11 7 12

12-> 9. ( 1 13 5 10)(3 15 8)( 4 14 11 7 12 9

9-> 4. ( 1 13 5 10)(3 15 8)( 4 14 11 7 12 9)

6-> 6 (1 13 5 10)(3 15 8) ( 4 14 11 7 12 9)

Hence S = (1 3 5 10) ( 3 15 8) ( 4 14 11 7 12 9)

2] The other cycle decompositions are constructed in exactly the same way

And so we have T = (1 14) ( 2 9 15 13 4)(3 10) ( 5 12 7) ( 8 11)

S^2 = (1 5) (3 8 15) (4 11 12) (7 9 14) (10 13)

ST = (1 11 3)(2 4)(5 9 8 7 10 15)( 13 14)

TS = (1 4) (2 9)( 3 13 12 15 11 5)( 8 10 14)

T^2 S = (1 2 15 8 3 4 14 11 12 13 7 5 10)