Spearman's Coefficient of rank Correlation

It is determined in the case where no numerical measure can be made. For Example: The characteristic like beauty, intelligence, honesty etc. Here, Rankings are often applied in these cases.

So our objective is to determine "Is there an association between the rankings?"

Spearman's coefficient of rank correlation $\boxed{\rho = 1 - \frac{6\Sigma D^2}{n(n^2-1)}}$

$D \rightarrow$ Difference between the two ranks given to each individual.

$n \rightarrow$ number of observations.

Note: (I) The range of ρ is between -1 to 1. i.e. $-1 \leq \rho \leq 1$.

(II) value +1 indicates perfect association for identical ranking

(III) value -1 indicates perfect association for reverse ranking.

Rank (R_1)	Rank (R_2)	$D = R_1 - R_2$	$D^2 = (R_1 - R_2)^2$
1	1	0	0
2	2	0	0
3	3	0	0
4	4	0	0
			$\Sigma D^2 = 0$

$$\rho = 1 - \frac{6\Sigma D^2}{n(n^2-1)} = 1 - \frac{6 \times 0}{4(4^2-1)} = 1 - 0 = 1$$

R_1	R_2	$D = R_1 - R_2$	$D^2 = (R_1 - R_2)^2$
1	4	-3	9
2	3	-1	1
3	2	1	1
4	1	3	9
			$\Sigma D^2 = 20$

$$\rho = 1 - \frac{6\Sigma D^2}{n(n^2-1)} = 1 - \frac{6 \times 20}{4(4^2-1)}$$

$$= 1 - \frac{120}{4 \times 15}$$

$$= 1 - \frac{120}{60} = 1 - 2 = -1$$

Ques: Ten competitors in a beauty contest are ranked by two judeges in the following order

I Judge: 1 6 5 10 3 2 4 9 7 8

II Judge: 6 4 9 8 1 2 3 10 5 7

Calculate the Spearman's rank correlation coefficient. Is there is an association between the ranking ?