(2) Find the rank correlation for the data

x	8	5	11	13	10	5	18	15	2	8
y	56	44	79	72	70	54	94	85	33	65

Soln:-

x	y	Rank (x)	Rank (y)	Adjust rank R_x	Adjust rank R_y	$d = R_x - R_y$
8	56	6	7	$\frac{6+7}{2} = 6.5$	7	-0.5
5	44	8	9	$\frac{8+9}{2} = 8.5$	9	-0.5
11	79	4	3	4	3	1
13	72	3	4	3	4	-1
10	70	5	5	5	5	0
5	54	8	8	8.5	8	0.5
18	94	1	1	1	1	0
15	85	2	2	2	2	0
2	33	10	10	10	10	0
8	65	6	6	6.5	6	0.5

d^2	0.25	0.25	1	1	0	0.25	0	0	0	0.25

$\Sigma d^2 = 3$

Now $\rho = 1 - \frac{6[\Sigma d^2 + C.F]}{n(n^2-1)}$

$n = 10$

$i = 2$

$C.F = \frac{1}{12}\sum_{i=1}^{K} m_i(m_i^2-1) = \frac{1}{12}\sum_{i=1}^{2} m_i(m_i^2-1)$

$m_1 = 2$

$m_2 = 2$

$= \frac{1}{12}\left[m_1(m_1^2-1) + m_2(m_2^2-1)\right]$

$= \frac{1}{12}\left[2(2^2-1) + 2(2^2-1)\right] = 1$

$$\therefore \rho = 1 - \frac{6[3+1]}{10(10^2-1)} = 1 - \frac{24}{990} = 0.976$$

(3) Find the rank correlation coefficient for the given data

x	50	33	40	10	15	15	65	24	15	57
y	12	12	24	6	15	4	20	9	6	18

Sol:

x	y	Rank x	Rank y	Adjust Rank Rx	Adjust Rank Ry	$d = Rx - Ry$	d^2
50	12	3	5	3	$\frac{5+6}{2} = 5.5$	-2.5	6.25
33	12	5	5	5	5.5	-0.5	0.25
40	24	4	1	4	1	3	9
10	6	10	8	10	$\frac{8+9}{2} = 8.5$	1.5	2.25
15	15	7	4	$\frac{7+8+9}{3} = 8$	4	4	16
15	4	8	10	8	10	-2	4
65	20	1	2	1	2	-1	1
24	9	6	7	6	7	-1	1
15	6	7	8	8	8.5	-0.5	0.25
57	18	2	3	2	3	-1	1

$i = 3, \quad m_1 = 3, \quad m_2 = 2, \quad m_3 = 2 \qquad \Sigma d^2 = 41$

$n = 10$

$$\rho = 1 - \frac{6\left(\Sigma d^2 + C.F\right)}{n(n^2-1)}$$

$$C.F = \frac{1}{12}\sum_{i=1}^{3} m_i(m_i^2-1) = \frac{1}{12}\left[m_1(m_1^2-1) + m_2(m_2^2-1) + m_3(m_3^2-1)\right]$$

$$C.F = \frac{1}{12}\left[3(3^2-1) + 2(2^2-1) + 2^2(2^2-1)\right]$$

$$= \frac{1}{12}\left[24 + 6 + 6\right] = \frac{36}{12} = 3$$

$$\therefore \rho = 1 - \frac{6\left[41+3\right]}{10(10^2-1)} = 1 - \frac{264}{990}$$

$$\boxed{\rho = 0.7333}$$

(3) Find the rank correlation for the data

x	68	64	75	50	64	80	75	40	55	64
y	74	58	68	45	61	60	68	48	50	74