Probability & Statistics Assignment 03   Date: 21/05/22

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Section: CS-4B

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Q1.

$$\bar{x}_1 = \frac{144}{6} = 24 \qquad \bar{x}_2 = \frac{110}{5} = 22$$

x	x^2
21	441
24	576
25	625
27	729
23	529
24	576
$\Sigma x / x^2$ 144	3476

$$S_1 = \sqrt{\frac{6(3476)-20736}{6(5)}} = S_1 = 2$$

S_2

x	x^2
110	2450

$$S_2 = \sqrt{\frac{5(2450)-110^2}{5(4)}}$$

$$S_2 = 2.739$$

T-test
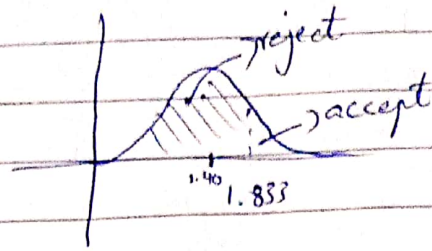
$$t = \frac{24-22}{2.357\sqrt{\frac{1}{6}+\frac{1}{5}}}$$

$$\Longrightarrow t = 1.40$$

$\alpha = 0.10$

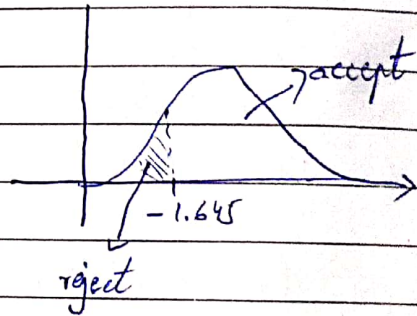$n_1 + n_2 \cdot 0 - 2 = 9$

$t_{0.05, 9} = 1.833$

$t = 1.40$

reject

accept

1.40 1.833

Q2.

a.) $z = \dfrac{6.1 - 6}{0.2/\sqrt{100}} = 5$

$H_0 = \mu = 6 \qquad H_1 : \mu < 6$

$z_{0.05} = -1.645$

accept

-1.645

reject

b.) $6.1 \pm 1.96\left(\dfrac{0.2}{\sqrt{100}}\right)$

6.1 ± 0.0392

$6.1 - 0.392 = 6.0608$

$6.1 + 0.0392 = 6.1392$

$6.0608 < \mu < 6.1392$

Q3.

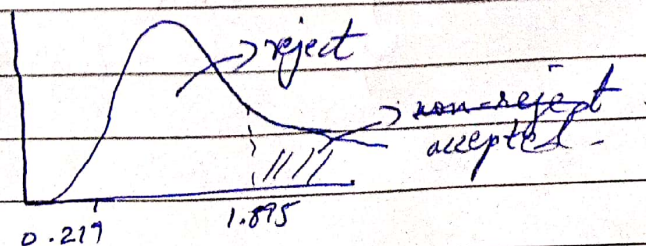| x_1	x_2	D	D^2
210	219	-9	81
230	236	-6	36
182	179	3	9
205	204	1	1
262	270	-8	64
253	250	3	9
219	222	-3	9
216	216	0	0
		$\Sigma D = -19$	$\Sigma D^2 = 209$

$$X_D = \frac{19}{8} = 2.375$$

$$S = \sqrt{\frac{8(209) - (-19)^2}{8(7)}} = 4.838$$

using t-test to evaluate results

$$t = \frac{X_D - \mu_o}{S_D/\sqrt{n}} = \frac{2.375 - 2}{4.838/\sqrt{8}} = 0.219$$

degree of freedom : $n - 1 = 7$

$$t_{0.05,7} = 1.875$$

reject

non-reject accepted

0.219   1.875

Q4.

i.)

n	x	y	xy	x^2	y^2
1	19	66	1254	361	4395
2	23	74	1702	529	5476
3	25	72	1800	625	5184
4	24	76	1824	576	5776
5	26	78	2028	676	6084
6	21	72	1512	441	5184
Σ	158	458	10120	3208	32066

$\Sigma x = 158$

$$a = \frac{4.38(3208) - 138(10120)}{6(3208) - (138)^2}$$

$$a = \frac{1405104 - 1396560}{19248 - 19044} = \frac{8544}{204}$$

$$a = 41.88$$

b.) $\dfrac{6(10120) - (138)(438)}{6(3208) - (138)^2}$

b.) $\dfrac{60720 - 60444}{19248 - 19044} = \dfrac{276}{204} = 1.353$

using line equation

$$y = a + bx$$
$$y = 41.88 + 1.353x$$

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Q4. (continued)

ii)

$$r = \frac{6(10120) - 138(438)}{\sqrt{[6(3208) - (138)^2][(6)(32060) - (438)^2]}}$$

$$r = \frac{60720 - 60444}{\sqrt{(204)(516)}}$$

$$= 0.8506$$

iii) $t_{0.025, 4} = 2.776$

$$t = r \sigma \sqrt{\frac{n-2}{1-r^2}} \qquad r = 0.8506, \; n = 6$$

$$r = 0.8506 \sqrt{\frac{6-2}{180 - (0.8506)^2}}$$

$$t = 3.235$$

Q5.

A	B	C	D
10	11	13	18
9	16	8	23
5	9	9	25

degree of freedom (between) $= k - 1 = 4 - 1 = 3$

degree of freedom (within) $= N - k = 12 - 4 = 8$

$$\bar{x_1} = \frac{24}{3} = 8$$

$$\bar{x_2} = \frac{36}{3} = 12$$

$$\bar{x_3} = \frac{50}{3} = 10$$

$$\bar{x_4} = \frac{60}{3} = 22$$

$$\frac{G}{N} = \frac{156}{12} = 13$$

$$S_{Total} = \Sigma(x - \bar{x})^2$$

$$S_{total} = 9 + 16 + 64 + 4 + 9 + 16 + 0 + 25 + 16 + 25 + 100 + 144$$
$$= 428$$

$$S_{within} = \Sigma(x - \bar{x})^2 + (x_2 - \bar{x_2})^2 + (x_3 - \bar{x_3})^2$$
$$= 4 + 1 + 9 + 1 + 16 + 9 + 9 + 4 + 1 + 16 + 1 + 9$$
$$= 80$$

$$S_{between} = 428 - 80 = 348$$

$$MS_{between} = \frac{S_{between}}{df_{between}} = \frac{348}{3} = 116$$

$$MS_{within} = \frac{S_{within}}{df_{within}} = \frac{80}{8} = 10$$

$$F_{critical} = \frac{MS(between)}{MS(within)} = \frac{116}{10} = 11.6$$

$$F_{critical} = 11.6$$

Since $11.6 > 7.59$, so failed null hypothesis.