PROB & STATS ASSIGNMENT 03

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SEC: B   **ROLL NO:** 20K-0183

QUESTION 01

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

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

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

$$S_2 , \qquad \frac{x}{110} \qquad \frac{x^2}{2450}$$

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

$$\boxed{S_2 = 2.739}$$

T-test

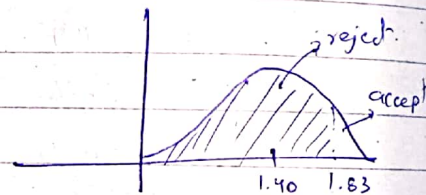$$t = \frac{24 - 22}{2.357\sqrt{\frac{1}{6} + \frac{1}{5}}}$$

$$\boxed{t = 1.40}$$

$\alpha = 0.10$

$n_1 + n_2 - 2 = 9$

$t_{0.05,\,9} = 1.833$

$t = 1.40$

QUESTION 02

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

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

$= 20.0 : -1.645$

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

6.1 ± 0.0392

$6.1 - 0.392 = 6.0608$

$6.1 + 0.0392 = 6.1392$

$\boxed{6.0608 < \mu < 6.1392}$

QUESTION 03

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

$$\Sigma D = -19 \qquad \Sigma D^2 = 209$$
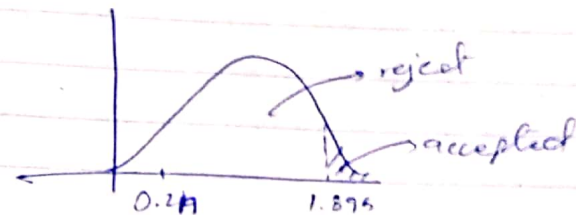
$$X_D = \frac{19}{8} = 2.375$$

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

$$\boxed{S = 4.838}$$

using t-test to evaluate result

$$t = \frac{x_0 - \mu_0}{S_0/\sqrt{n}} = \frac{2.375 - 2}{4.838/\sqrt{8}} = 0.219$$

degree of freedom $= n - 1 = 7$

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

0.219   1.875

QUESTION 04

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
	138	458	10120	3208	32060

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

$$a = \frac{8544}{204}$$

$$\boxed{a = 41.86}$$

$$b = 6\,(10120) - (138)(438)$$

$$= \frac{60220 - 60444}{1848 - 19044} = \frac{276}{204} = 1.353$$

using line equation

$$y = a + bx$$

$$y = 41.88 + 1.353x$$

ii)

$$r = \frac{6(10120) - 138(435)}{\sqrt{[6(3208) - 138^2][6(32060) - 435^2]}}$$

$$= \frac{60720 - 60444}{\sqrt{204 \times 516}}$$

$$\boxed{r = 0.8506}$$

iii) $t_{0.05,4} = 2.776$

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

$$t = 0.8506\sqrt{\frac{6-2}{1-(0.8506)^2}}$$

$$\boxed{t = 3.235}$$

QUESTION 06

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

degree of freedom b/w = $K-1 = 4-1 = 3$
degree of freed (within) = $N-K = 12-4 = 8$

$$\bar{X_1} = \frac{24}{3} = 8$$
$$\bar{X_2} = \frac{36}{3} = 12$$
$$\bar{X_3} = \frac{30}{3} = 10$$
$$\bar{X_4} = \frac{66}{3} = 22$$

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

$$S_{total} = \Sigma(x - \bar{x})^2$$
$$S_{total} = 9 + 16 + 64 + 4 + 9 + 16 + 0 + 25 + 16 + 25$$
$$+ 100 + 144$$
$$\boxed{S_{total} = 428}$$

$$S_{within} = \sum (x - \bar{x})^2 + (x_2 - \bar{x}_1)^2 + (x_3 - \bar{x}_3)^2$$

$$= 4 + 1 + 9 + 1 + 16 + 9 + 7 + 4 + 1 + 1 + 9 + 1 + 9$$

$$\boxed{S_{within} = 80}$$

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

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

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

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

$$\boxed{F_{critical} = 11.6}$$

Since $11.6 > 7.59$ Thus we can say that the hypothesis is not valid.