GATEWAY CLASSES
Empowering learners, transforming futures

DPP-3 Maths-4 Unit-5

Topic- t-test for two samples

Q-1- Two samples of sodium vapour were tested for length of life and following results were got

	Size	Sample Mean	Sample S.D
Type I	8	1234 hrs	36 hrs
Type II	7	1036 hrs	40 hrs

Is the difference in the means significant to generalise that type I is superior to Type II regarding length of life?

Sol- Given: $n_1 = 8$, $n_2 = 7$

$\bar{x} = 1234$, $\bar{y} = 1036$

$S_1 = 36$, $S_2 = 40$

$$S = \sqrt{\frac{n_1 S_1^2 + n_2 S_2^2}{n_1 + n_2 - 2}}$$

$$S = \sqrt{\frac{8 \times (36)^2 + 7 \times (40)^2}{13}}$$

$$\boxed{S = 40.7317}$$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes PYQs Solution Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

Null Hypothesis (H_0)

H_0 : The means of the two population are same.

H_0 : $\mu_1 = \mu_2$

Alternative Hypothesis (H_1)

H_1 : $\mu_1 \neq \mu_2$

$$|t| = \frac{\bar{x} - \bar{y}}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$|t| = \frac{1234 - 1036}{40.7317\sqrt{\frac{15}{56}}} = \frac{198}{40.73 \times 0.50}$$

$$\boxed{|t| = 9.48}$$

Degree of freedom $= n_1 + n_2 - 2$
$= 8 + 7 - 2$
$= 13$

Level of Significance $= 5\% = 0.05$

$$\boxed{t_{0.05} = 2.16}$$

Conclusion $\Rightarrow \because |t| > t_{0.05}$

$\therefore$ H_0 Hypothesis is rejected

Type I is definately superior to Type II.

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes
PYQs Solution
Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

Q-2- The marks obtained by a group of 9 regular students and another group of 11 part time course students in a test are given below:

Regular: 56 62 63 54 60 51 67 69 58

Part time: 62 70 71 62 60 56 75 64 72 68 66

Examine whether the marks obtained by regular students and part time students differ significantly at 5% and 1% level of significance.

Sample 1 → marks of regular students
Sample 2 → marks of part time students

$n_1 = 9, \quad n_2 = 11$

x	$(x-\bar{x})$	$(x-\bar{x})^2$	y	$(y-\bar{y})$	$(y-\bar{y})^2$
56	-4	16	62	-4	16
62	2	4	70	4	16
63	3	9	71	5	25
54	-6	36	62	-4	16
60	0	0	60	-6	36
51	-9	81	56	-10	100
67	7	49	75	9	81
69	9	81	64	-2	4
58	-2	4	72	6	36
			68	2	4
			66	0	0

$\Sigma x = 540$ $\quad \Sigma(x-\bar{x})^2 = 280$ $\quad \Sigma y = 726$ $\quad \Sigma(y-\bar{y})^2 = 334$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes PYQs Solution Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

Mean ⇒ $\bar{x} = \frac{\Sigma x}{n_1} = \frac{540}{9} = 60$

$\bar{y} = \frac{\Sigma y}{n_2} = \frac{726}{11} = 66$

$$S = \sqrt{\frac{\Sigma(x-\bar{x})^2 + \Sigma(y-\bar{y})^2}{n_1+n_2-2}}$$

$$S = \sqrt{\frac{280+334}{18}}$$

$$\boxed{S = 5.84}$$

Null Hypothesis (H_0)

H_0: The mean of two population are same.

$H_0 = \mu_1 = \mu_2$

$$|t| = \frac{\bar{x} - \bar{y}}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$|t| = \frac{60-66}{5.84\sqrt{\frac{1}{9}+\frac{1}{11}}} = \frac{-6}{5.84 \times 0.449}$$

$$\boxed{|t| = 2.29}$$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes
PYQs Solution
Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

Degree of freedom = $n_1 + n_2 - 2$
= 18

i)
Level of Significance = 5% = 0.05

$$t_{0.05} = 2.10$$

Conclusion :-

$$|t| > t_{0.05}$$

∴ H_0 Hypothesis is rejected. At 5% level of significance regular students and part time students marks differ significantly.

ii) Level of Significance = 1% = 0.01

$$t_{0.01} = 2.88$$

Conclusion :

$$\because |t| < t_{0.01}$$

∴ Ho Hypothesis is accepted means of the two population are same.

Hence, Marks of regular students and part time students not differ.

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes
PYQs Solution
Recorded Lectures