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Roll no: 73 Sub:- EM-IV

Q1.]

→ $n_1 = 9$ and $n_2 = 7$

$\bar{x}_1 = 196.42$ and $\bar{x}_2 = 198.82$

$\Sigma(x_{1i} - \bar{x}_1)^2 = 26.940$

$\Sigma(x_{2i} - \bar{x}_2)^2 = 18.73$

Step1: Null Hypothesis (H_0): $\mu_1 = \mu_2$ [i.e the Samples are drawn from the Same population]

Alternative Hypothesis (H_a): $\mu_1 != \mu_2$ [i.e The Same Samples are not drawn from the Same population]
[Two tailed test]

step2:

LOS = 5% [two tailed test]

Degree of freedom = $n_1 + n_2 - 2 = 9 + 7 - 2 = 14$

Critical value $(t_\alpha) = 2.145$

Step3:

Since Samples are Small

$$S_p = \sqrt{\frac{\Sigma(x_{1i} + \bar{x}_1)^2 + \Sigma(x_{2i} + \bar{x}_2)^2}{n_1 + n_2 - 2}}$$

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$$= \sqrt{\frac{(26.94) + (18.73)}{14}}$$

$$= 1.8061$$

$$S.E = S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

$$= 1.8061 \sqrt{\frac{1}{9} + \frac{1}{7}}$$

$$= 0.9102$$

step 4: Test statistics

$$t_{cal} = \frac{\overline{x_1} - \overline{x_2}}{S.E}$$

$$= \frac{196.42 - 198.82}{0.9102}$$

$$= -2.6368$$

steps: Decision
Since $|t_{cal}| > t_\alpha$; H_0 is rejected
Samples cannot be considered to have been drawn from same population.

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Q8] $f(z) = \dfrac{1}{(z-3)(z-2)}$ $\quad |z| > 3$

→ Here $|z| > 3$ $\therefore |z| > 2$

i.e $|z/3| > 1$ & $|z/2| > 1$

i.e $|3/z| < 1$ & $|2/z| < 1$

Hence, we take out z from the partial fraction

$$\frac{1}{(z-3)(z-2)} = \frac{A}{(z-3)} + \frac{B}{(z-2)}$$

$$1 = A(z-2) + B(z-3)$$

if $z = 2$ $\quad$ if $z = 3$

$B = -1$ $\quad$ $A = 1$

$$\frac{1}{(z-3)(z-2)} = \frac{1}{z-3} - \frac{1}{z-2}$$

$$f(z) = \frac{1}{z(1-3/z)} - \frac{1}{z(1-2/z)}$$

$$= \frac{1}{z}\left(1 - \frac{3}{z}\right)^{-1} - \frac{1}{z}\left(1 - \frac{2}{z}\right)^{-1}$$

By Binomial expansion.

$$(1-x)^{-1} = (1 + x + x^2 + \dots)$$

$$\therefore f(z) = \frac{1}{z}\left(1 + \frac{3}{z} + \frac{3^2}{z^2} + \dots + \frac{3^{k-1}}{z^{k-1}} + \dots\right)$$

$$- \frac{1}{z}\left(1 + \frac{2}{z} + \frac{2^2}{z^2} + \dots + \frac{2^{k-1}}{z^{k-1}} + \dots\right)$$

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$$= \left(\frac{1}{z} + \frac{3}{z^2} + \cdots \frac{3^{k-1}}{z^k} + \cdots\right) - \left(\frac{1}{z} + \frac{2}{z^2} + \cdots + \frac{2^{k-1}}{z^k} + \cdots\right)$$

$\therefore$ coefficient of $z^{-k} = 3^{k-1} - 2^{k-1}, k \geq 1$

$\therefore Z^{-1}[F(z)] = \{3^{k-1} - 2^{k-1}\}, k \geq 1$