TOPIC

Engineering Probability and Statistics – Section II – Question 9

QUESTION

Two types of plastic are suitable for use in an electronics component manufacturer. The breaking strength of this plastic is important. It is known that $\sigma_1 = 2$ psi and $\sigma_2 = 3$ psi. For a random sample of size $n_1 = 10$ and $n_2 = 13$, we obtain $\bar{x}_1 = 156$ psi, and $\bar{x}_2 = 163$ psi. The company will not adopt plastic 2 unless $\mu_2 - \mu_1 > 5$ psi. Consider the hypothesis test $H_0: \mu_2 - \mu_1 = 5$ versus $H_1: \mu_2 - \mu_1 > 5$. The P-value of this test most nearly is

   (A) 0.010
   (B) 0.028
   (C) 0.053
   (D) 0.086

HINT

Since both variances are known, this is a z test. Then the P-value for hypothesis test $H_0: \mu_2 - \mu_1 = \mu_0$ versus $H_1: \mu_2 - \mu_1 > \mu_0$ is $1 - \Phi(z_0)$, where

$$z_0 = \frac{\bar{x}_2 - \bar{x}_1 - \Delta_0}{\sqrt{\frac{\sigma_2^2}{n_2} + \frac{\sigma_1^2}{n_2}}}.$$

SOLUTION

$$z_0 = \frac{\bar{x}_2 - \bar{x}_1 - \Delta_0}{\sqrt{\frac{\sigma_2^2}{n_2} + \frac{\sigma_1^2}{n_2}}}$$

$$= \frac{163 - 156 - 5}{\sqrt{\frac{2^2}{13} + \frac{3^2}{10}}}$$

$$= 1.914.$$

P-value = 0.028.

ANSWER

(B)

CONTRIBUTOR

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