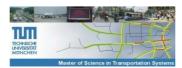
M.Sc. in ,Transportation Systems'



Applied Statistics in Transport

Exercises: Hypotheses Testing, Statistical Tests

- 1. In road construction for highways, the pavement is specified to be at least 0.5 centimetres thick by one of the many quality measures. The thickness is known to be $N(\mu, \sigma=0.2)$. The quality control system uses a significance level of 0.05. In 50 samples on one day, the mean thickness was 0.43 centimetres. Should the operator adjust the machine or is the thickness sufficient?
- 2. In a nuclear power plant, the cold start procedure consists of bringing the reactor to 35% of power, and then to 65% of power, before full operation. At each stage, engineers make measurements of several critical reactor attributes. If the binding energy does not have an exact mean rate of 11.5 MeV at 35% power, then the reactor could cascade into a critical configuration at subsequent power levels. Set up the hypothesis for a decision system at the 35% power level stage using $\alpha=0.05$. It is known that the population of measurement errors is normal with standard deviation $\sigma=1.5$. On this day's power-up, the sample mean of nine observations is 10.2 MeV. What should the operators of the reactor do?
- 3. Compute the two t-tests including the p-value and the confidence interval without the command t.test:

```
> t.test(1:10,7:20)
        Welch Two Sample t-test
data: 1:10 and 7:20
t = -5.4349, df = 21.982, p-value = 1.855e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -11.052802 -4.947198
sample estimates:
mean of x mean of v
               13.5
      5.5
> t.test(1:10)
        One Sample t-test
data: 1:10
t = 5.7446, df = 9, p-value = 0.0002782
alternative hypothesis: true mean is not equal to 0
95 percent confidence interval:
 3.334149 7.665851
sample estimates:
mean of x
      5.5
```